Virtual Medical Record (vMR) for Clinical Decision Support – Domain Analysis Model

Project Coordinator and Document Editor
Kensaku Kawamoto, MD, PhD, University of Utah

Collaborators
David Shields, University of Utah
Andrew K. McIntyre, FRACP, MBBS, Medical-Objects
Yongjian Bao, PhD, GE Healthcare
Howard R. Strasberg, MD, MS, Wolters Kluwer Health
Peter R. Tattam, Tattam Software Enterprises Pty Ltd
Scott Bolte, MS, GE Healthcare
Peter Scott, MBBS, Medical-Objects
Keith Boone, GE Healthcare
Zhijing Liu, PhD, Siemens Healthcare
Chris Melo, Philips Healthcare
Nathan Hulse, PhD, Intermountain Healthcare
Jim Basilakis, MBBS, MS, University of Western Sydney
Robert Worden, Open Mapping Software, Limited
Daryl Chertcoff, HLN Consulting
Clayton Curtis, MD, PhD, U.S. Veterans Health Administration
Guilherme Del Fiol, MD, PhD, University of Utah
Emory Fry, MD, Uniformed Service University Health Sciences
Jean-Charles Dufour, MD, PhD, Université Aix-Marseille
Laurent CHARLOIS, Université de la Méditerranée

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Executive Summary

A Virtual Medical Record (vMR) for Clinical Decision Support (CDS) is a data model for representing clinical information relevant to CDS. The vMR encompasses data about a patient's demographics and clinical history, as well as CDS inferences about the patient (e.g., recommended clinical interventions).

This Domain Analysis Model (DAM) includes the following:

- A specification of a vMR for CDS
- Structural specifications for inputs and outputs of CDS engines, which are composed primarily of vMR data
- A structural specification for identifying input data requirements for specific CDS use cases

In addition, examples are provided for clinical data represented using a vMR structure.

What is not provided in this DAM, but which are expected to be needed for specific CDS implementations using the vMR include the following:

- Templates that constrain the vMR and its components for specific interoperability settings
- Implementation guides for platform-specific implementation approaches for the vMR
- Mappings between HL7 balloted information structures and the vMR

Of note, the HL7 vMR project team plans on developing the above required resources and to contribute them through HL7 and through other dissemination channels. In particular, OpenCDS (http://www.opencds.org) will be making many of the above resources available as open-source contributions.

The vMR DAM was initially balloted in May 2010. Since then, the comments from that ballot have been incorporated to develop a DAM that is more closely aligned with the HL7 Reference Information Model. In particular, the vMR DAM has been re-designed so that it can be more easily populated from standard HL7 artifacts such as the HL7 Continuity of Care Document (CCD). vMR project team members have vetted and iteratively refined the approach proposed in this DAM through implementations of draft versions of the DAM, such as through the OpenCDS initiative.

vMR DAM Specification

1. Modeling Methodology

The vMR DAM was developed in several stages.

As an important initial step the vMR project team conducted a multi-institutional analysis of CDS data needs encompassing 20 CDS systems from 4 nations, which included both large-scale home-grown CDS systems (e.g., CDS systems of the Veterans Health Administration, Intermountain Healthcare, and Partners Healthcare) as well as a number of commercial CDS systems (Siemens Soarian, Eclipsys Sunrise, Medical-Objects CDS, Altos OncoEMR, Hughes riskApps, Wolters Kluwer Health Infobutton API, and Medi-Span). This analysis identified the use of 131 atomic data elements across the 20 CDS systems. A manuscript summarizing the findings from this study is available at http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3041317/.

Using the results of this multi-institutional CDS data needs analysis as the foundation, an initial DAM was developed using the following modeling guidelines:

- Encompass all data elements identified as being used for CDS by the multi-institutional CDS data needs analysis
- Use an extensible modeling approach, with the understanding that the model can be restricted later through implementation guides and profiles.

The result of the above methodology was the initial vMR DAM, which was balloted in May 2010. The ballot did pass the informative guide approval vote requirements. Subsequently, the vMR project team sought to do the following: (i) address the peer review comments and insights received during this process and (ii) implement draft versions of the vMR specification to ensure its usability. As some specific enhancements to the vMR resulting from this process, the vMR now includes concrete, constrained data types derived from ISO 21090 data types, and the vMR was more closely aligned with normative HL7 constructs to better enable semantic interoperability with these models.

2. Model Artifacts and Examples

A separate file archive that accompanies this document contains the following model artifacts and examples:

- The Enterprise Architect UML model (.EAP) containing the vMR DAM. Of note, this ballot document wa auto-generated from this Enterprise Architect file using a custom reporting template included in the file.
- An XMI UML file (.xmi) exported from Enterprise Architect
- A set of XML Schemas (.xsd), primarily auto-generated from the Enterprise Architect model, to provide an example of a potential platform-specific implementation of the vMR.
- XML examples of vMR instances (.xml) conformant with the above vMR XML schemas.

Provided below is detailed documentation of the vMR DAM.

3. Domain Analysis Model

Details of the vMR Domain Analysis Model are provided below.

3.1 modelParent

Type: **Package**
Package: Model

The modelParent package is the parent package containing the following subsidiary model packages:
- cdsInput: specifies the data input used by CDS systems.
- cdsOutput: specifies the data output generated by CDS systems.
- cdsInputSpecification: specifies the specific CDS input data required for a specific CDS use case.
- vmr: specifies information about a patient relevant for CDS.
- dataTypes: specifies data types used; constrained version of ISO 21090 data types.

Note that this is a platform-independent, logical information model from which platform-specific information models can be derived.

3.1.1 cdsInput

Type: **Package**
Package: modelParent

Specifies input data used by CDS systems.

cdsInput - *(Class diagram)*

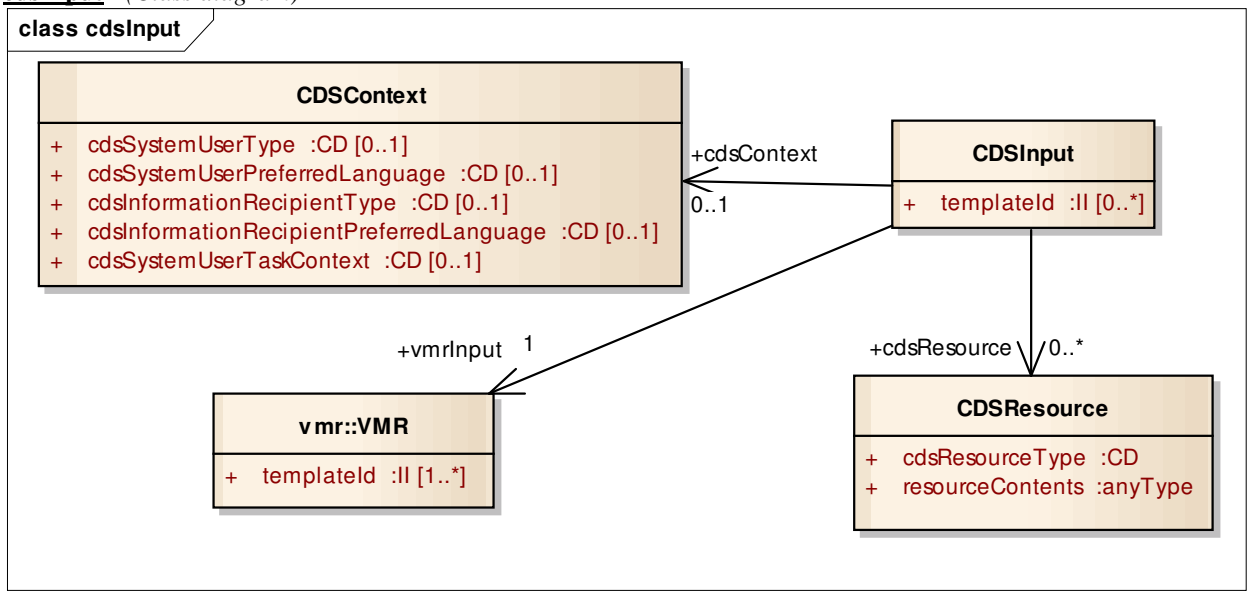

Figure: 1

3.1.1.1 CDSContext

Type: **Class**
Package: cdsInput

The situation or context within which a CDS evaluation is made. Included in CDS inputs for HL7 Context-Aware Knowledge Retrieval (Infobutton) Knowledge Request standard. Used, for example, to generate human-readable care guidance in the end-user's preferred language.

Attributes

Attribute	Notes
cdsSystemUserType CD [0..1]	The type of individual using the CDS system. E.g., patient, healthcare provider, or specific type of healthcare provider (physician, nurse, etc.).
cdsSystemUserPreferredLanguage CD [0..1]	Preferred language of the person who is using the system. Used, for example, to indicate the language in which the user interface should be rendered. E.g., English, Spanish.
cdsInformationRecipientType CD [0..1]	The type of individual who consumes the CDS content. May be different from CDS system user type (e.g., if clinician is getting disease management guidance for provision to a patient). E.g., patient, healthcare provider, or specific type of healthcare provider (physician, nurse, etc.).
cdsInformationRecipientPreferredLanguage CD [0..1]	Preferred language of the person who will consume the CDS content. Used, for example, to indicate the language in which the content should be written. E.g., English, Spanish.
cdsSystemUserTaskContext CD [0..1]	The task that a CDS system user is performing. E.g., laboratory results review, medication list review. Can be used to tailor CDS outputs, such as recommended information resources.

3.1.1.2 CDSInput

Type: **Class**
Package: cdsInput

The parent class containing the data used by a CDS system to generate inferences. Includes an input vMR and optionally CDS context and/or CDS resource data.

Attributes

Attribute	Notes
templateId II [0..*]	The identifier of a set of constraints placed on a CDS input.

3.1.1.3 CDSResource

Type: **Class**
Package: cdsInput

A resource independent of individual patients, provided to a CDS engine to facilitate patient evaluation. Includes, for example, local antibiogram data (local susceptibility profile of microbes to different antimicrobial agents), local formulary restrictions, or CDS system user preference on which guidelines to use for health maintenance (e.g., HEDIS vs. USPSTF).

Attributes

Attribute	Notes
cdsResourceType CD	The type of CDS resource, as defined by a coded taxonomy. A resource independent of individual patients, provided to a CDS engine to facilitate patient evaluation. E.g., local antibiogram, local formulary restrictions, CDS system user preference on which guidelines to use for health maintenance (e.g., HEDIS vs. USPSTF). The specified information structure used to convey the related resourceContents must be identifiable from the cdsResourceType.
resourceContents anyType	The information structure of the resource depends on the CDS resource type. E.g., local antibiogram data, local formulary restrictions, CDS system user preference on which guidelines to use for health maintenance (e.g., HEDIS vs. USPSTF).

3.1.2 cdsOutput

Type: **Package**
Package: modelParent

Specifies output data generated by CDS systems.

cdsOutput - *(Class diagram)*

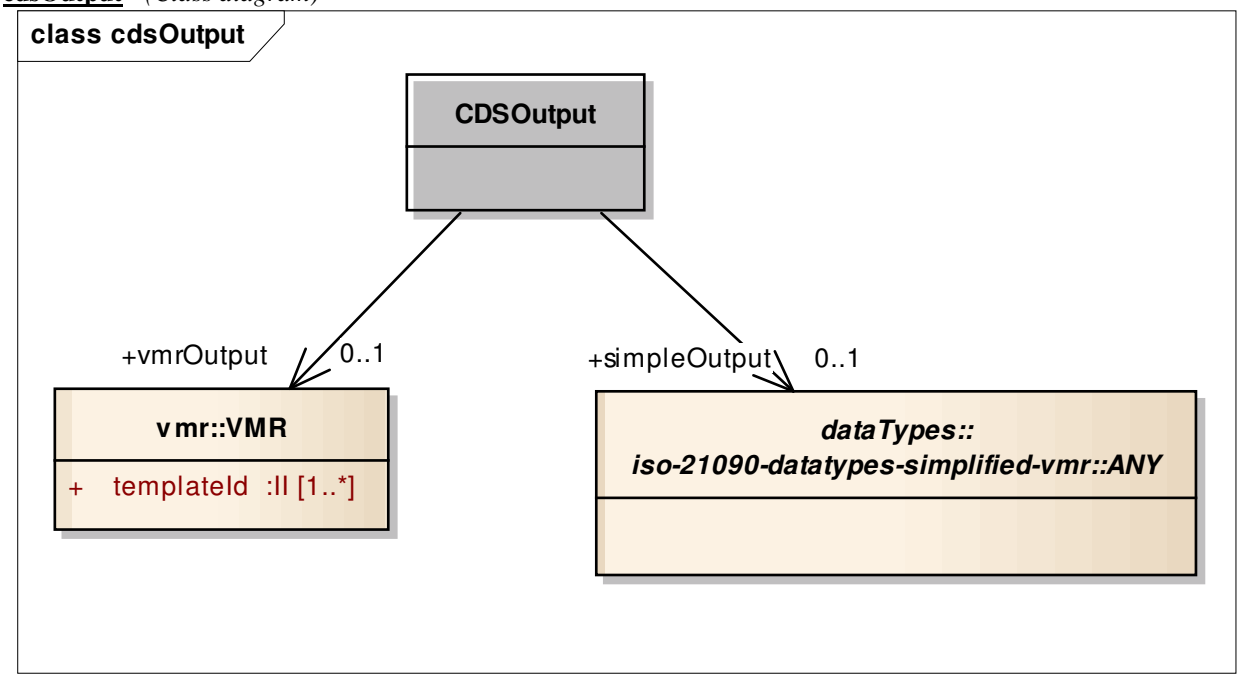

Figure: 2

3.1.2.1 CDSOutput

Type: **Class**
Package: cdsOutput

The parent class containing the data used by a CDS system to communicate inferences. Can use the vMR data structure or a base data type to communicate the results.

3.1.3 cdsInputSpecification

Type: **Package**
Package: modelParent

Specifies the specific CDS input data required for a specific CDS use case.

cdsInputSpecification - *(Class diagram)*

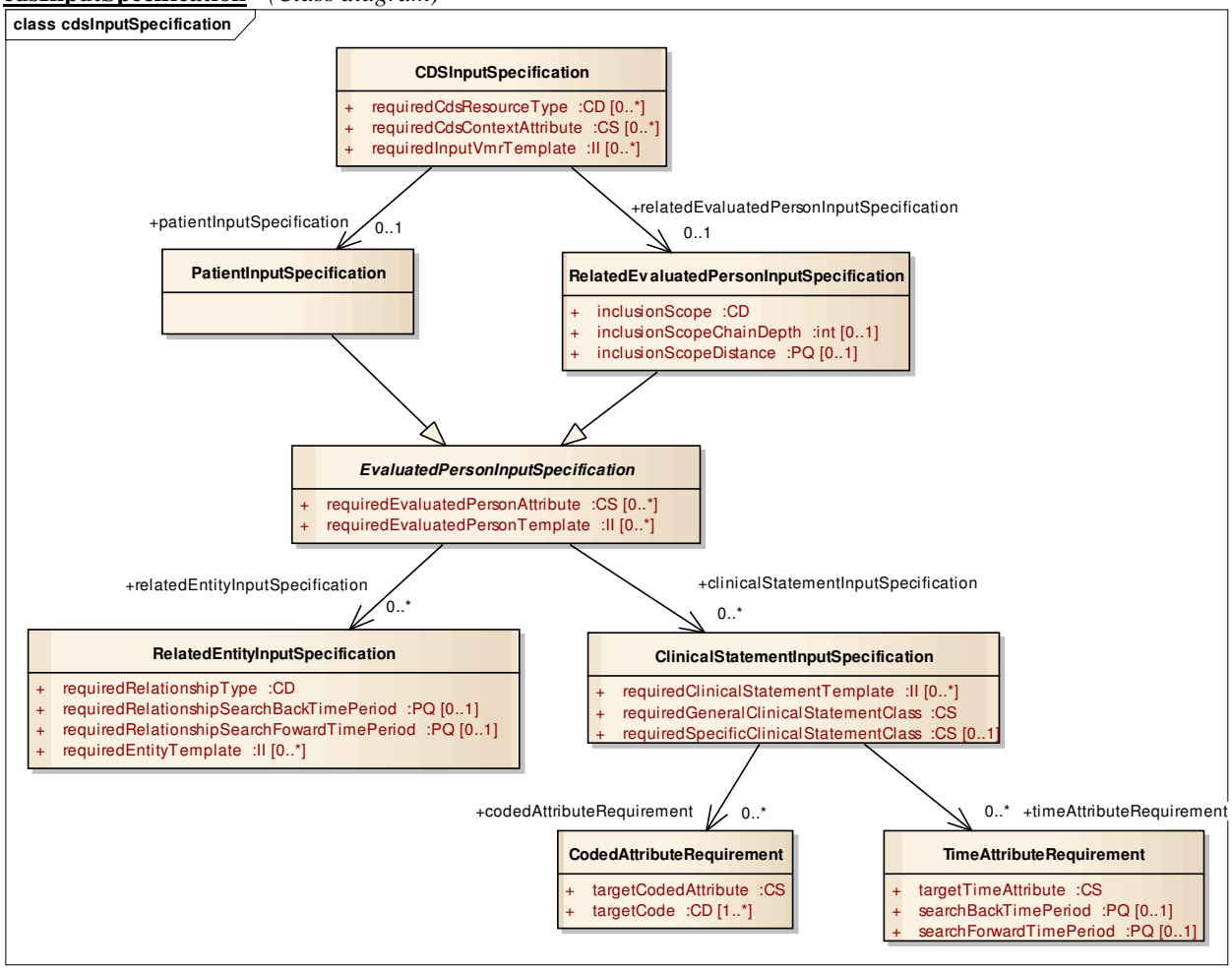

Figure: 3

3.1.3.1 CDSInputSpecification

Type: **Class**
Package: cdsInputSpecification

The parent class containing the data required by a specific CDS use case. For example, this class can be used to specify that the evaluation of a patient for the need for a mammogram requires the following data: (i) gender; (ii) age; (iii) past mastectomy history; and (iv) past mammogram history.

Can include a detailed input specification for the focal patient as well as for related evaluated persons. Note that it is assumed that the superset of data required for related evaluated persons are the same for each of the related

evaluated persons (e.g., relatives). If input specifications are not provided regarding patients or other evaluated persons, then this signifies that no further constraints are being placed on required data other than what is expressed through the input data model and its existing template(s).

Attributes

Attribute	Notes
requiredCdsResourceType CD [0..*]	The type of CDS resource required. Required input parameters (e.g., mammogram testing frequency) can be specified using this attribute (e.g., with a CD representing mammogram testing frequency).
requiredCdsContextAttribute CS [0..*]	The CDS context attribute (e.g., CDS system user preferred language) required.
requiredInputVmrTemplate II [0..*]	Identifier of a set of constraints that must be placed on the input vMR.

3.1.3.2 ClinicalStatementInputSpecification

Type: **Class**
Package: cdsInputSpecification

Specifies the clinical statements required regarding the evaluated person of interest. Can include CodedAttributeRequirements and TimeAttributeRequirements.

If no CodedAttributeRequirement specified, all relevant clinical statements are required regardless of their coded attributes. If no TimeAttributeRequirement specified, all relevant clinical statements are required regardless of their time attributes. All specified CodedAttributeRequirements and TimeAttributeRequirements should be fulfilled in provided ClinicalStatements.

Attributes

Attribute	Notes
requiredClinicalStatementTemplate II [0..*]	Identifier of a set of constraints that must be placed on the ClinicalStatement. Allows, for example, the specification of required detailed clinical models that correspond to templates.
requiredGeneralClinicalStatementClass CS	The general class of clinical statement required. E.g., Procedure, Observation. If only the general clinical statement type is specified (i.e., requiredSpecificClinicalStatementType is not specified), then it will be assumed that all members of the specified general clinical statement types are desired.
requiredSpecificClinicalStatementClass CS [0..1]	The specific class of clinical statement required. E.g., ProcedureOrder, ObservationEvent.

3.1.3.3 CodedAttributeRequirement

Type: **Class**
Package: cdsInputSpecification

A requirement for a coded attribute of a clinical statement. Specified in terms of the target coded attribute and the code(s) for that attribute that allow the requirement to be fulfilled.

Attributes

Attribute	Notes
targetCodedAttribute CS	The clinical statement's coded attribute that is the subject of restriction. E.g., problem code, problem status.
targetCode CD [1..*]	A target code for the target coded attribute. If a clinical statement has a target coded attribute (e.g., problem code) that matches one of the target codes (e.g., ICD9CM 250.00), then the coded attribute requirement is met.

3.1.3.4 EvaluatedPersonInputSpecification

Type: **Class**
Package: cdsInputSpecification

Specifies the data required for an evaluated person. Can include (i) a specification of the person attributes (e.g., gender) required; (ii) a specification of the templates that must be applied; (iii) a specification of the data required for related entities; and (iv) a specification of the clinical statements required.

Attributes

Attribute	Notes
requiredEvaluatedPersonAttribute CS [0..*]	Required attribute of the EvaluatedPerson. Note that if an attribute is required by a specified template, it must be provided regardless of whether its need is specified here.
requiredEvaluatedPersonTemplate II [0..*]	Identifier of a set of constraints that must be placed on the EvaluatedPerson.

3.1.3.5 PatientInputSpecification

Type: **Class** **EvaluatedPersonInputSpecification**
Package: cdsInputSpecification

The data required for the patient. Is a specialization of the EvaluatedPersonInputSpecification class.

3.1.3.6 RelatedEntityInputSpecification

Type: **Class**
Package: cdsInputSpecification

Specifies the data required regarding entities related to the evaluated person of interest.

Attributes

Attribute	Notes
requiredRelationshipType CD	Required type of relationship to Entities other than EvaluatedPersons, if available. Note that requirements for other EvaluatedPersons are specified separately within the RelatedEvaluatedPersonInputSpecification class. E.g., primary care provider, health insurance provider.
requiredRelationshipSearchBackTimePeriod PQ [0..1]	This requirement is met if the relationship time interval overlaps with the time interval that starts at (index evaluation time) and ends at (index evaluation time + requiredRelationshipSearchForwardTimePeriod). The earlier point is considered to be exclusive and the ending point is considered to be inclusive. E.g., if the index evaluation time is 7/1/2011 at 4pm and the requiredRelationshipSearchForwardTimePeriod is 1 year, then this requirement is met if the relationshipTimeInterval overlaps with any time after 4pm on 7/1/2011 and up to and including 7/1/2012 at 4pm.
requiredRelationshipSearchFowardTimePeriod PQ [0..1]	This requirement is met if the relationship time interval overlaps with the time interval that starts at (index evaluation time - requiredRelationshipSearchBackTimePeriod) and ends at (index evaluation time). The earlier point is considered to be exclusive and the ending point is considered to be inclusive. E.g., if the index evaluation time is 7/1/2011 at 4pm and the requiredRelationshipSearchBackTimePeriod is 1 year, then this requirement is met if the relationshipTimeInterval overlaps with any time after 4pm on 7/1/2010 and up to and including 7/1/2011 at 4pm.
requiredEntityTemplate II [0..*]	Identifier of a set of constraints that must be placed on the related Entity.

3.1.3.7 RelatedEvaluatedPersonInputSpecification

Type: **Class** **EvaluatedPersonInputSpecification**
Package: cdsInputSpecification

The data required for evaluated persons related to the patient. Is a specialization of the EvaluatedPersonInputSpecification class. Includes a specification of the scope of evaluated persons that are required.

Attributes

Attribute	Notes
inclusionScope CD	The scope of evaluated persons to include. E.g., relative, sexual contacts, persons living in affected geographic zone.
inclusionScopeChainDepth int [0..1]	The number of links to traverse to identify evaluated persons within the specific scope. E.g., 3 in combination with scope of relative would indicate up to 3rd degree relatives. If neither inclusionScopeChainDepth nor inclusionScopeDistance are specified, then all available evaluated persons with the indicated scope should be included. E.g., if inclusion scope is sexual contact and no scope depth/distance is specified, then all sexual contacts of the focal person and of other persons related through sexual contact should be included.
inclusionScopeDistance PQ [0..1]	The distance to traverse to identify evaluated persons within the specific scope. E.g., 5 miles in combination with scope of living in affected area would indicate people living within a 5 mile radius of a location of interest. If neither inclusionScopeChainDepth nor inclusionScopeDistance are specified, then all available evaluated persons with the indicated scope should be included. E.g., if inclusion scope is sexual contact and no scope depth/distance is specified, then all sexual contacts of the focal person and of other persons related through sexual contact should be included.

3.1.3.8 TimeAttributeRequirement

Type: **Class**
Package: cdsInputSpecification

A requirement for a time attribute of a clinical statement. Specified in terms of the target time attribute and the required time interval for that attribute in related to the index evaluation time. A searchBackTimePeriod and/or a searchForwardTimePeriod must be provided.

Attributes

Attribute	Notes
targetTimeAttribute CS	The time attribute targeted for restriction. E.g., procedure time, substance dispensation time.
searchBackTimePeriod PQ [0..1]	The time attribute requirement is met if the target time attribute overlaps with the time interval that starts at (index evaluation time - searchBackTimePeriod) and ends at (index evaluation time). The earlier point is considered to be exclusive and the ending point is considered to be inclusive. E.g., if the index evaluation time is 7/1/2011 at 4pm and the searchBackTimePeriod is 1 year, then the time attribute requirement is met if the targetTimeAttribute has overlaps with anytime after 4pm on 7/1/2010 and up to and including 7/1/2011 at 4pm.

Attribute	Notes
searchForwardTimePeriod PQ [0..1]	The time attribute requirement is met if the target time attribute overlaps with the time interval that starts at (index evaluation time) and ends at (index evaluation time + searchForwardTimePeriod). The earlier point is considered to be exclusive and the ending point is considered to be inclusive. E.g., if the index evaluation time is 7/1/2011 at 4pm and the searchForwardTimePeriod is 1 year, then the time attribute requirement is met if the targetTimeAttribute has overlaps with anytime after 4pm on 7/1/2011 and up to and including 7/1/2012 at 4pm.

3.1.4 vmr

Type: **Package**
Package: modelParent

Specifies information about a patient relevant for CDS.

vmr - *(Class diagram)*

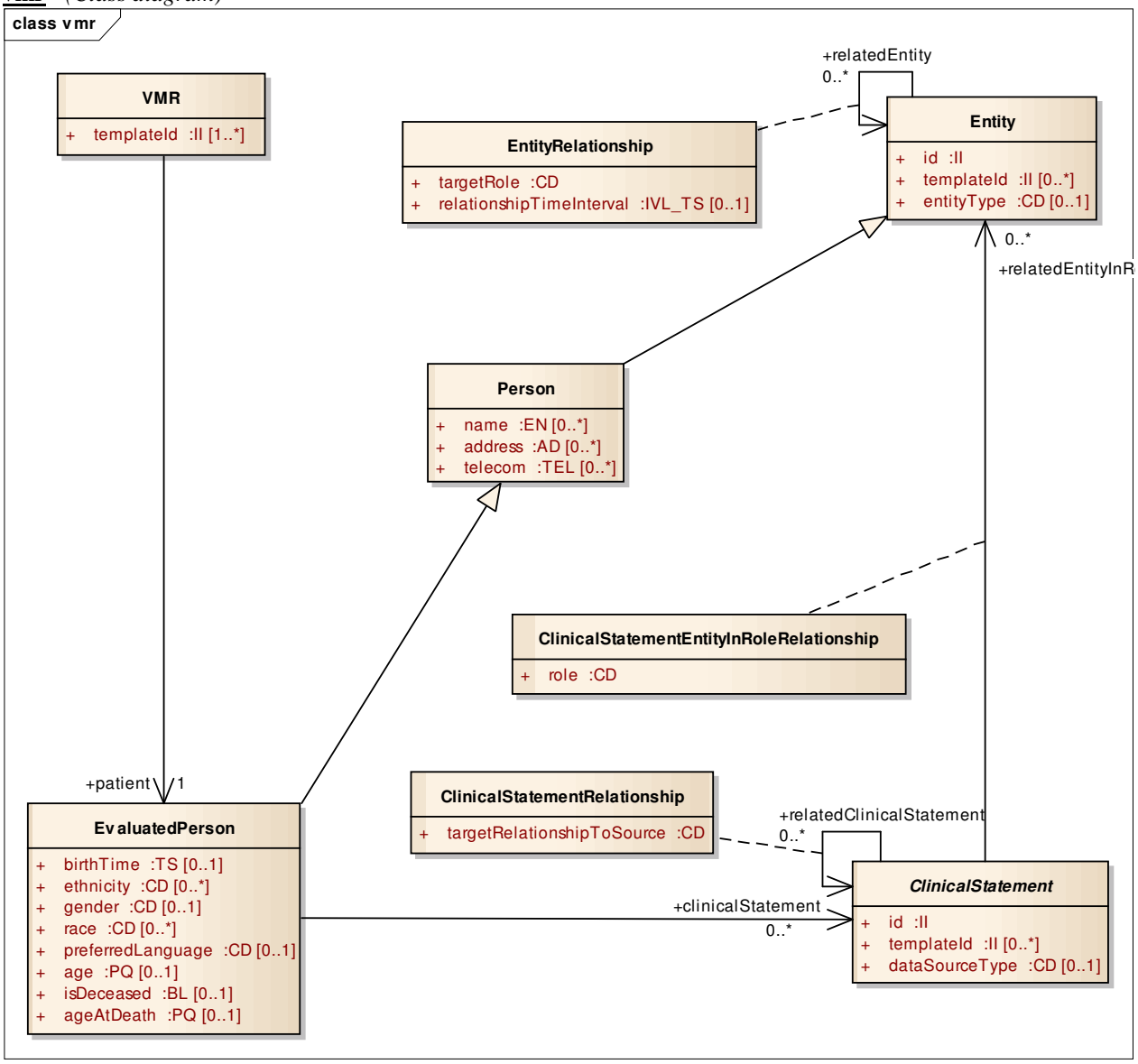

Figure: 4

entity - *(Class diagram)*

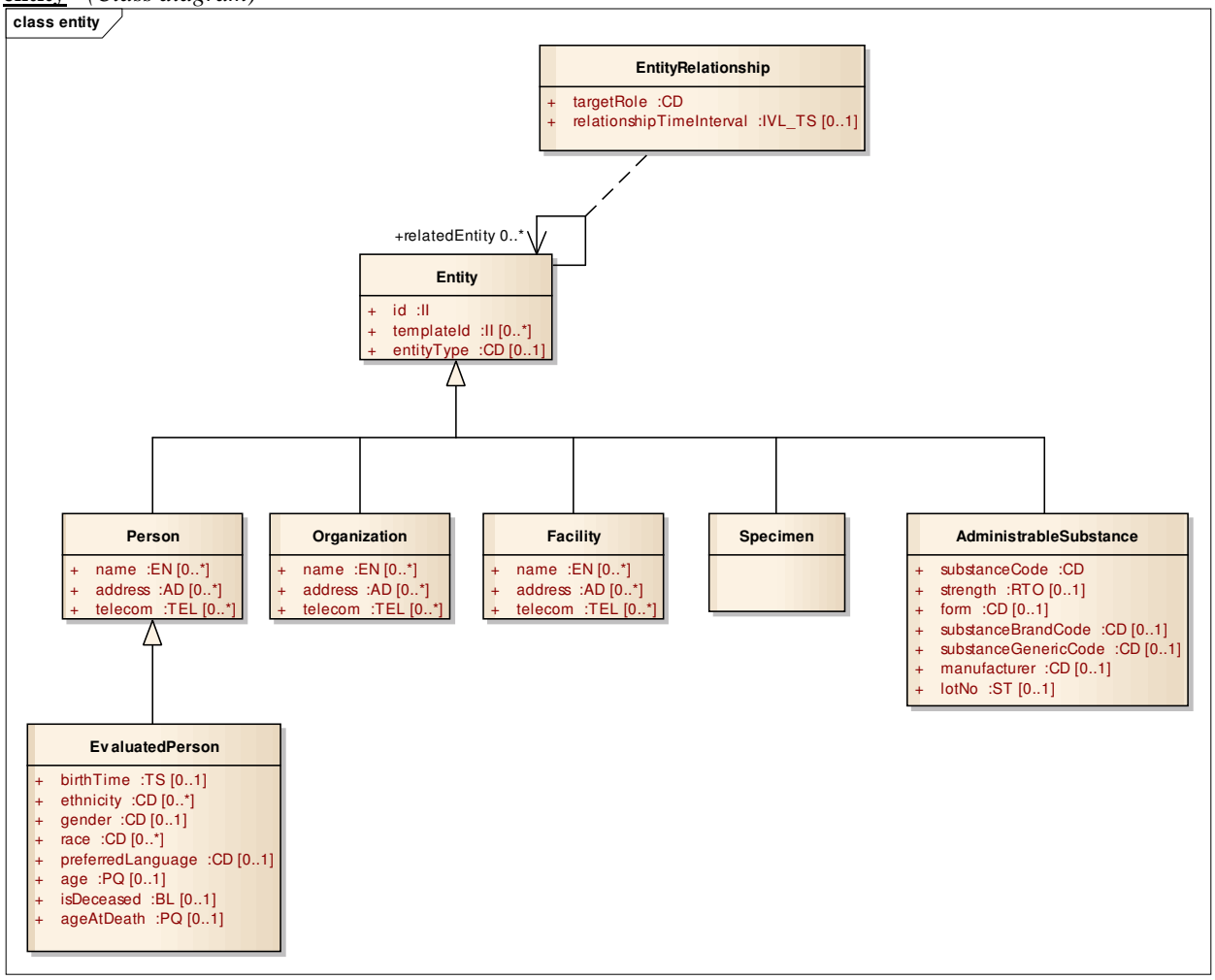

Figure: 5

clinicalStatement - *(Class diagram)*

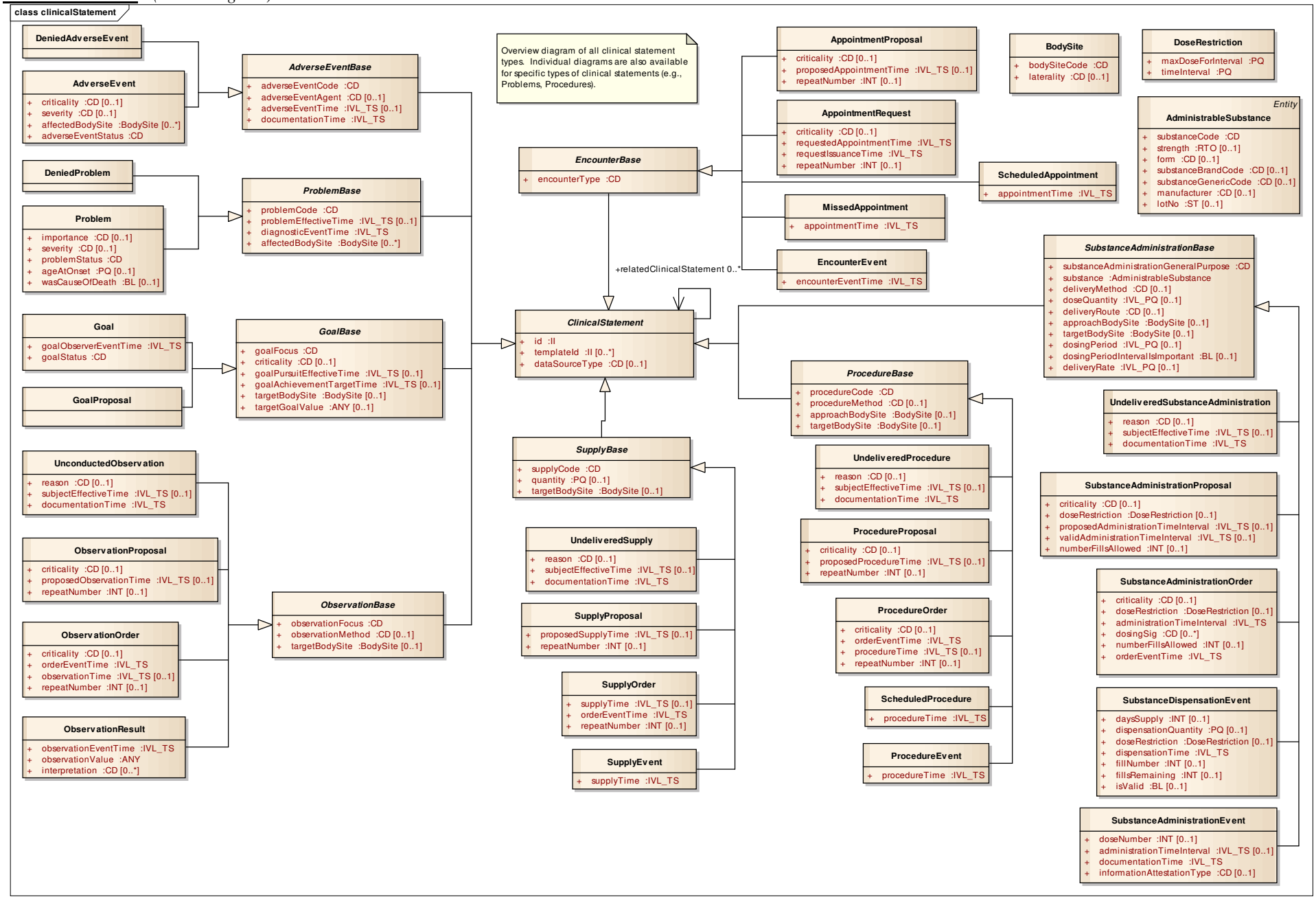

Figure: 6

adverseEvent - *(Class diagram)*

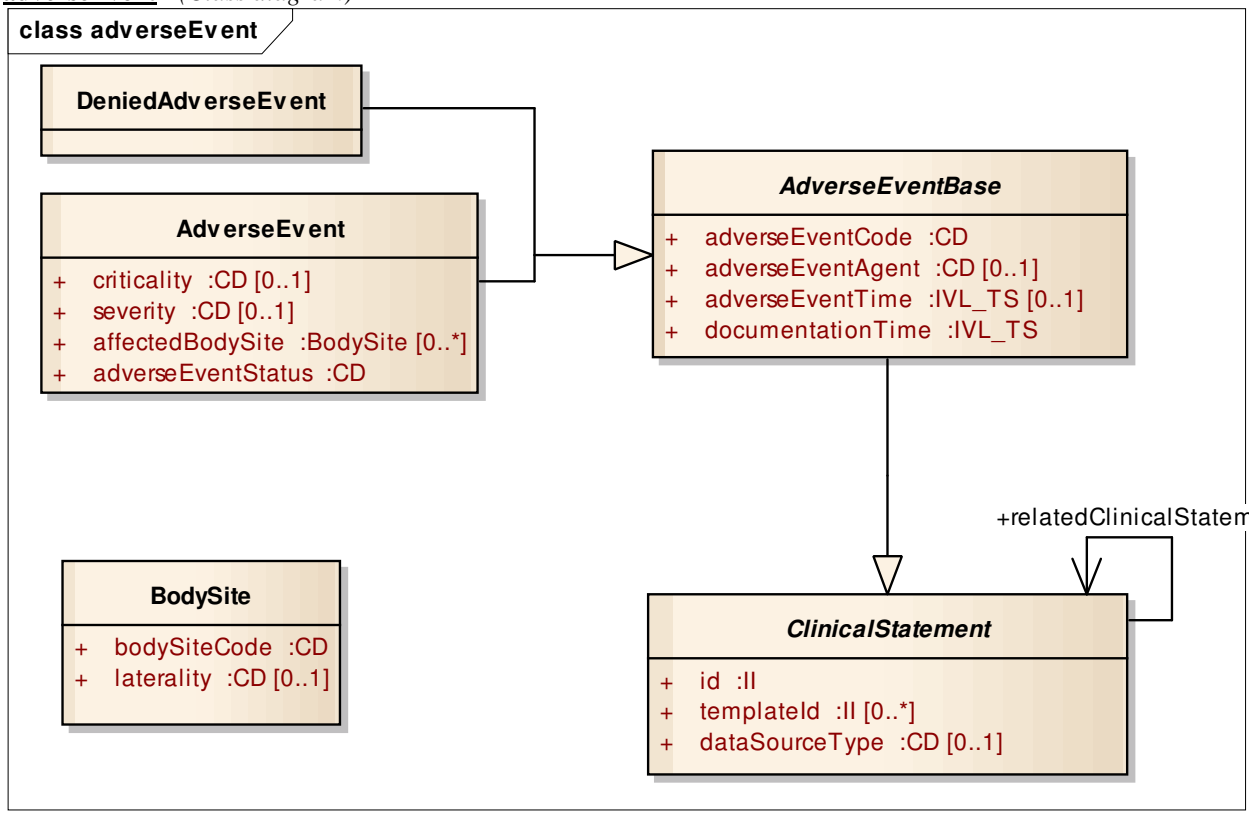

Figure: 7

encounter - *(Class diagram)*

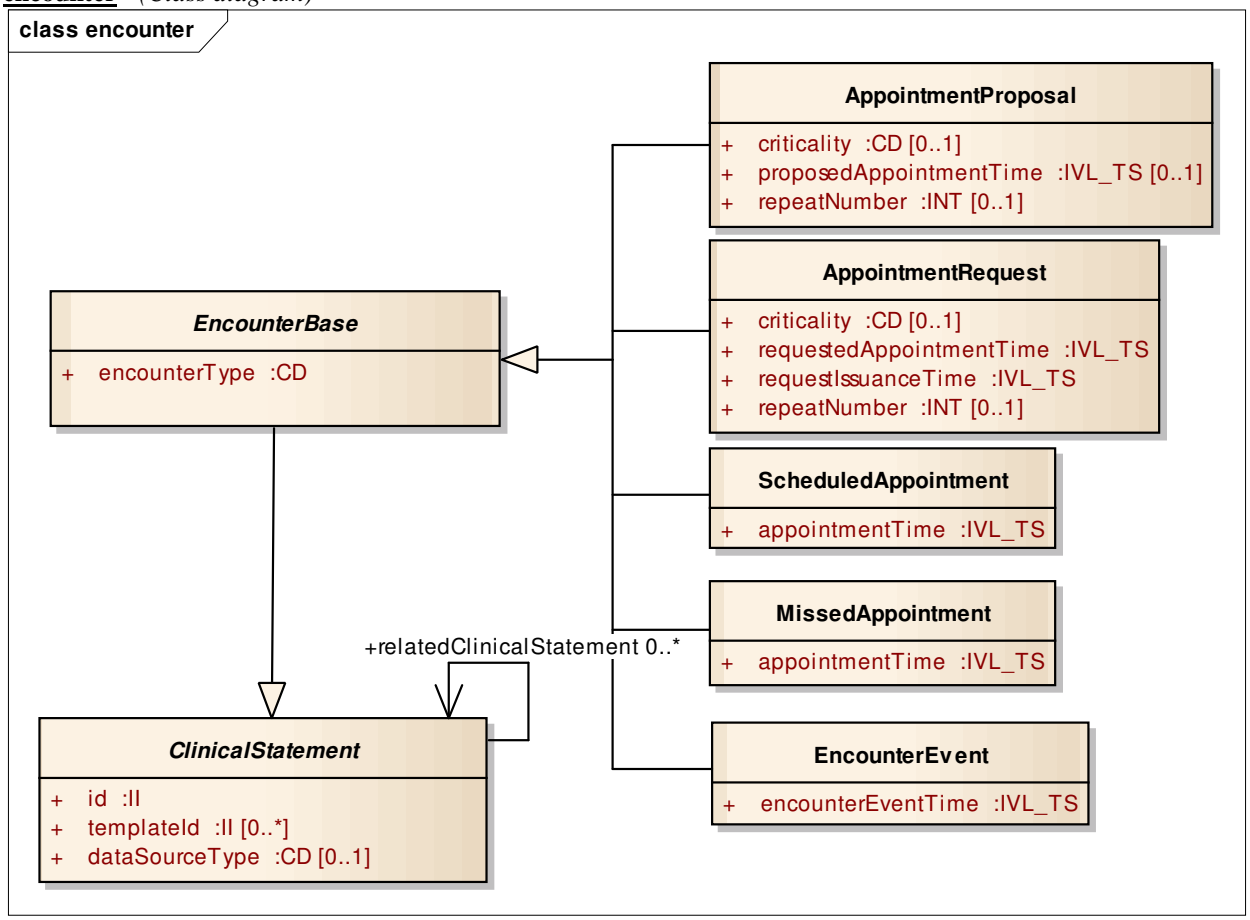

Figure: 8

goal - *(Class diagram)*

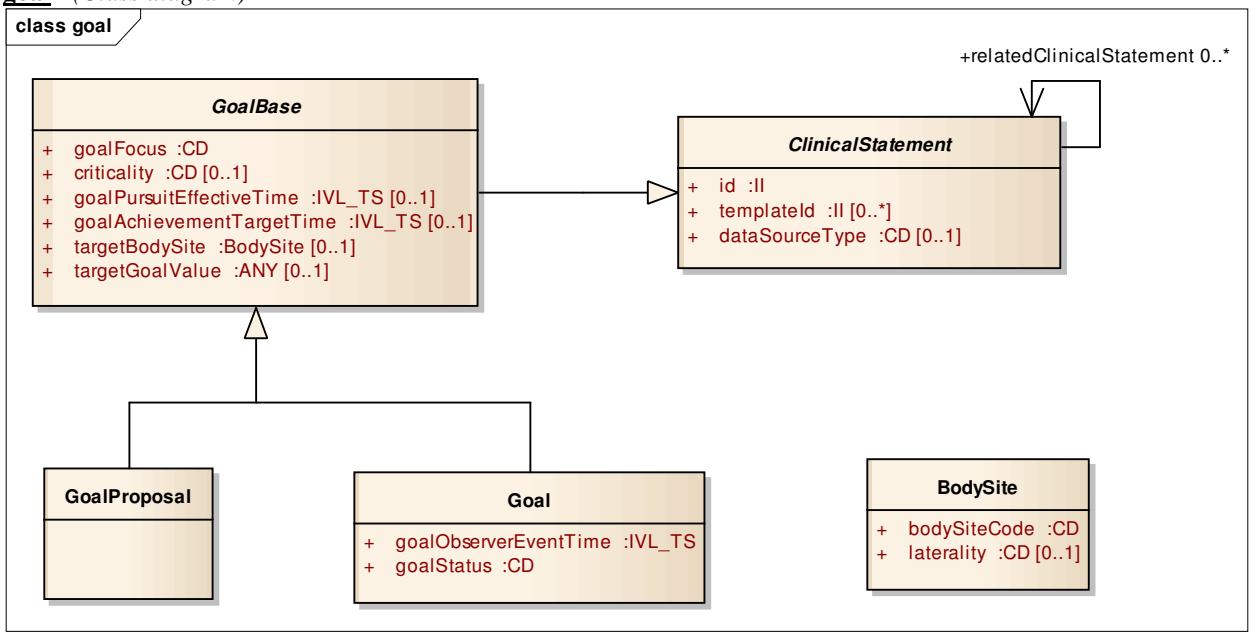

Figure: 9

observation - *(Class diagram)*

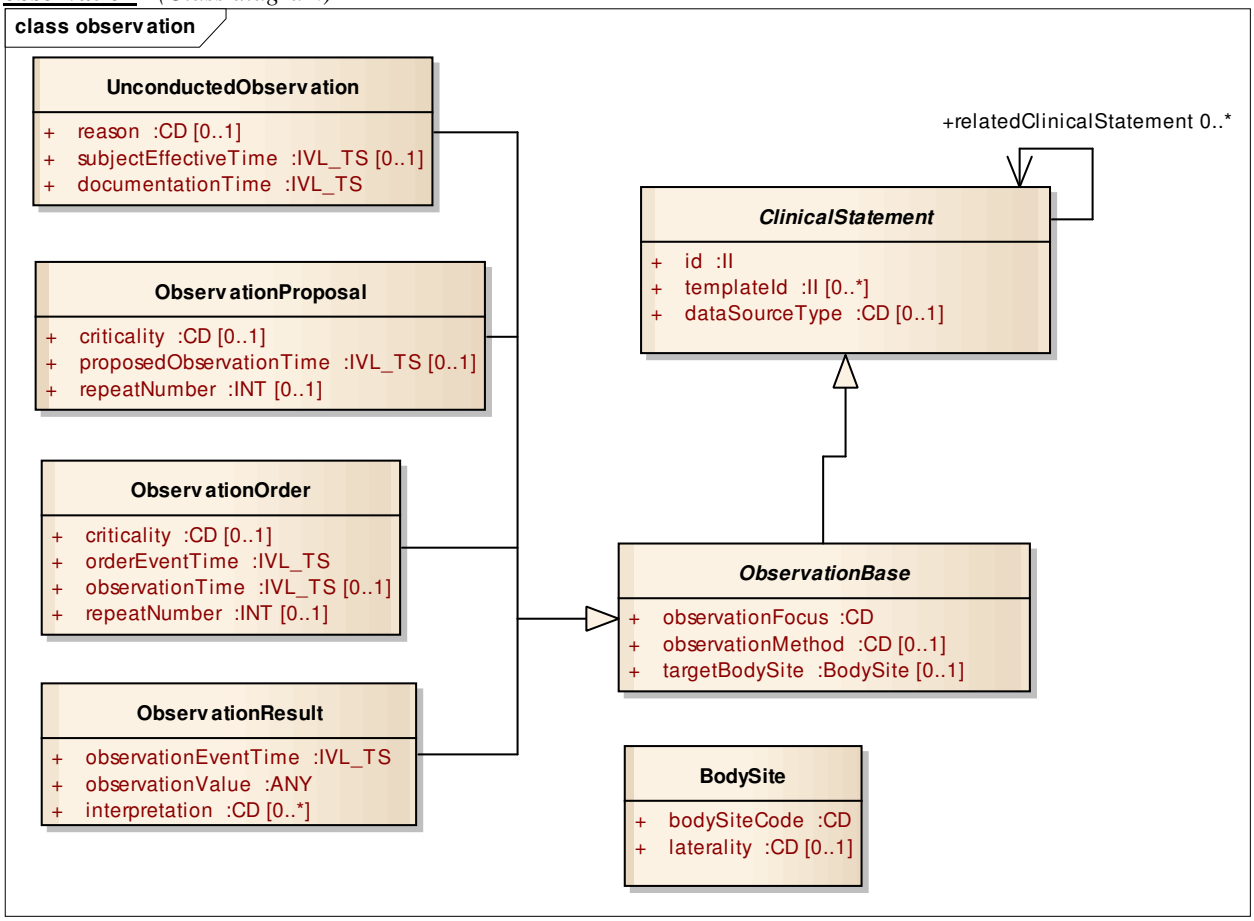

Figure: 10

problem - *(Class diagram)*

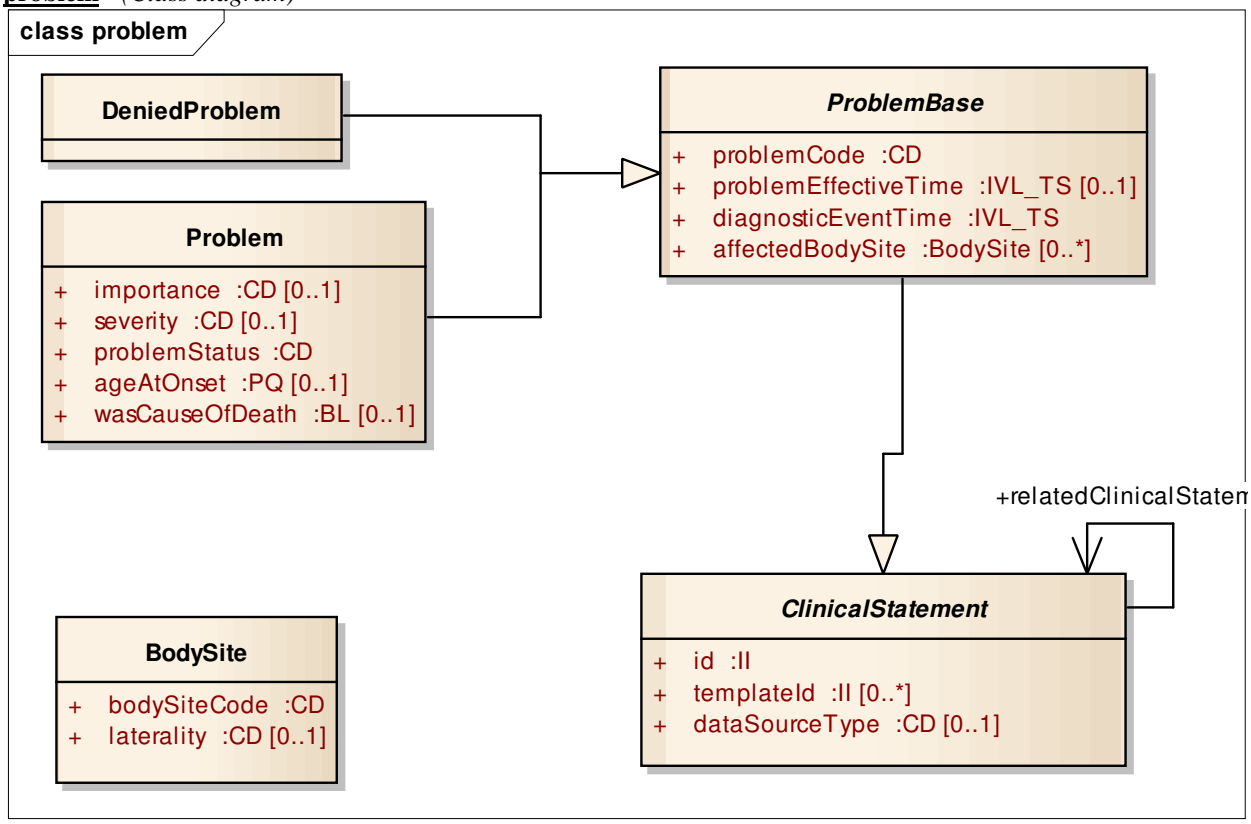

Figure: 11

procedure - *(Class diagram)*

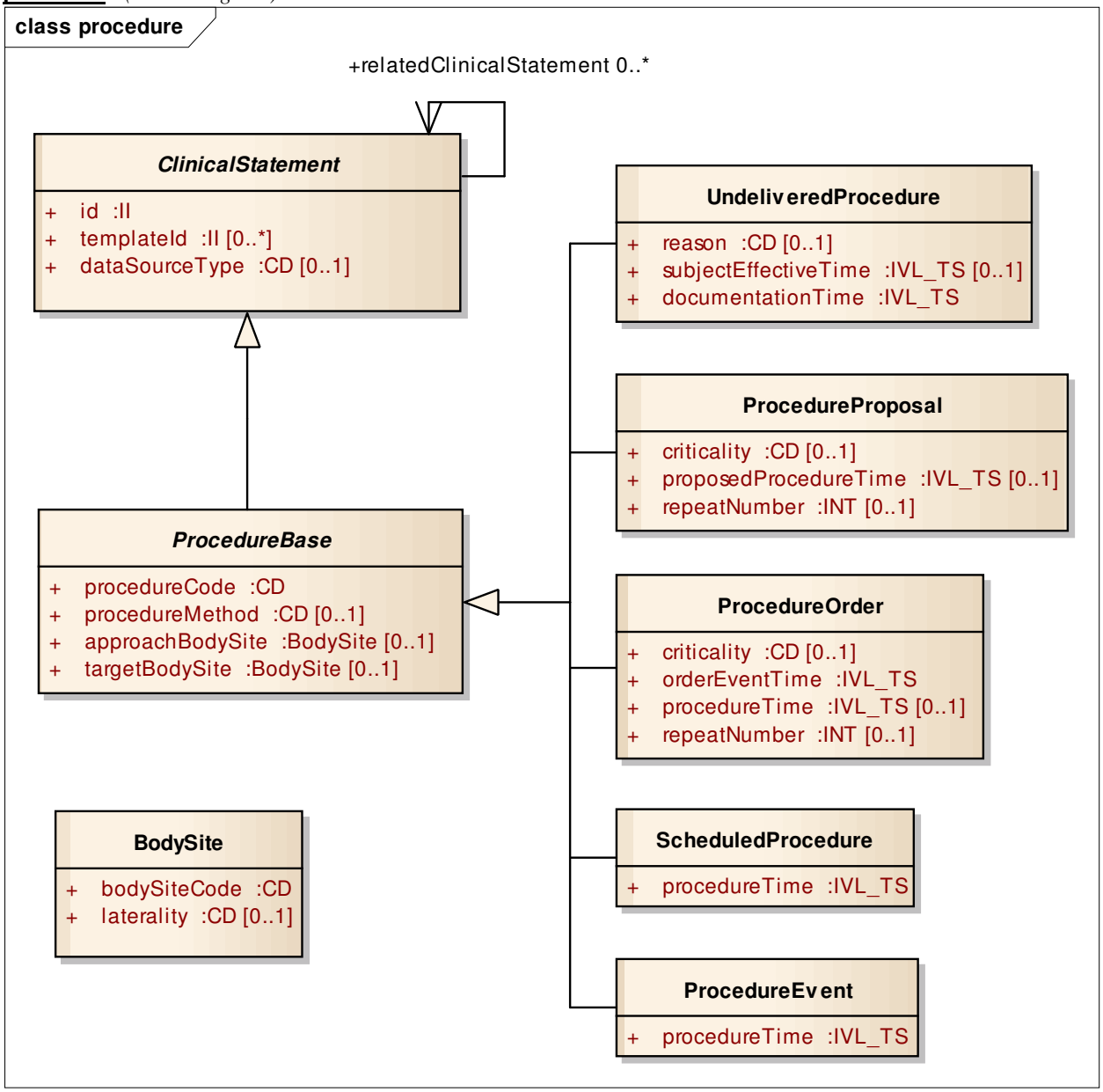

Figure: 12

substanceAdministration - *(Class diagram)*

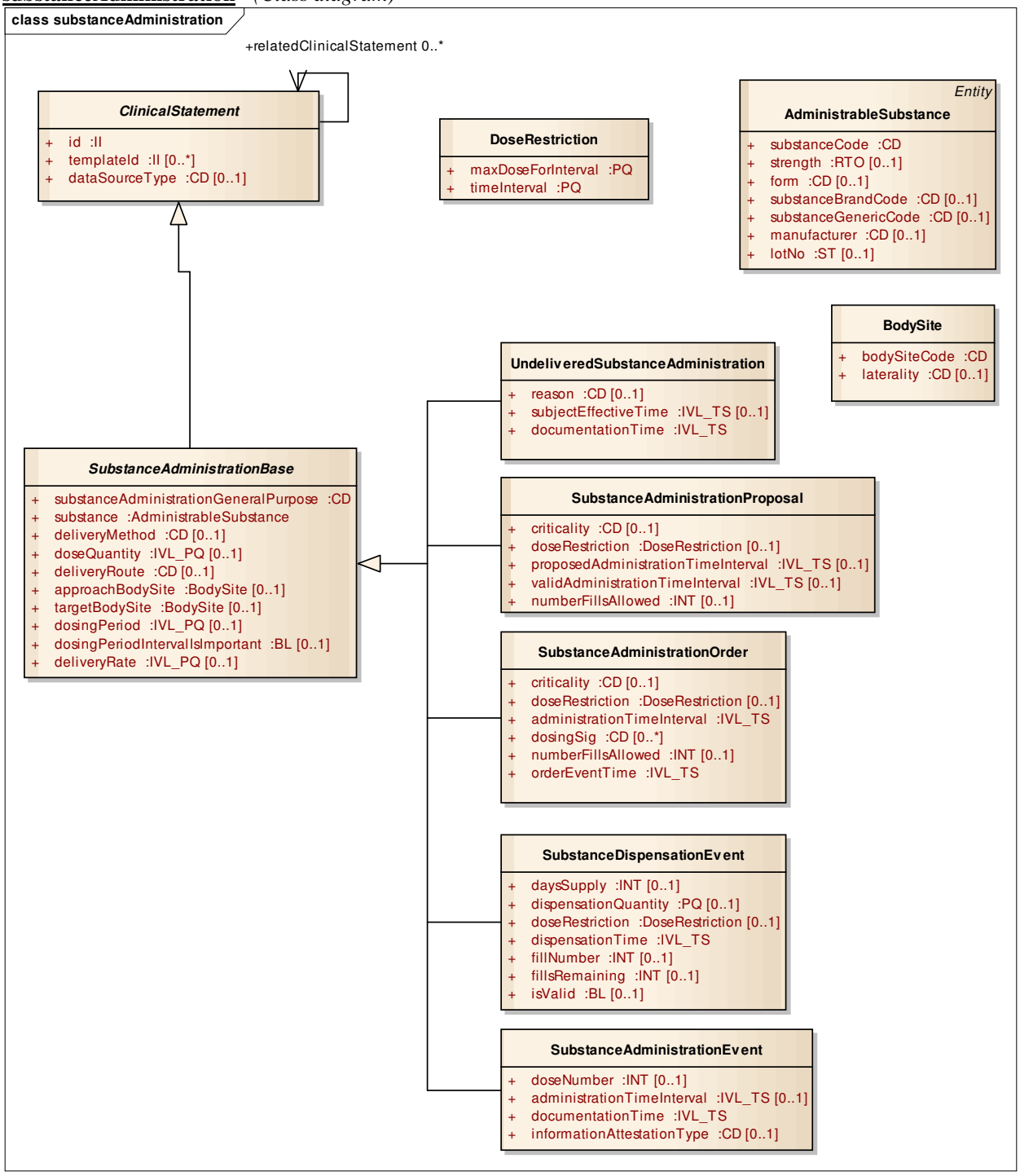

Figure: 13

supply - *(Class diagram)*

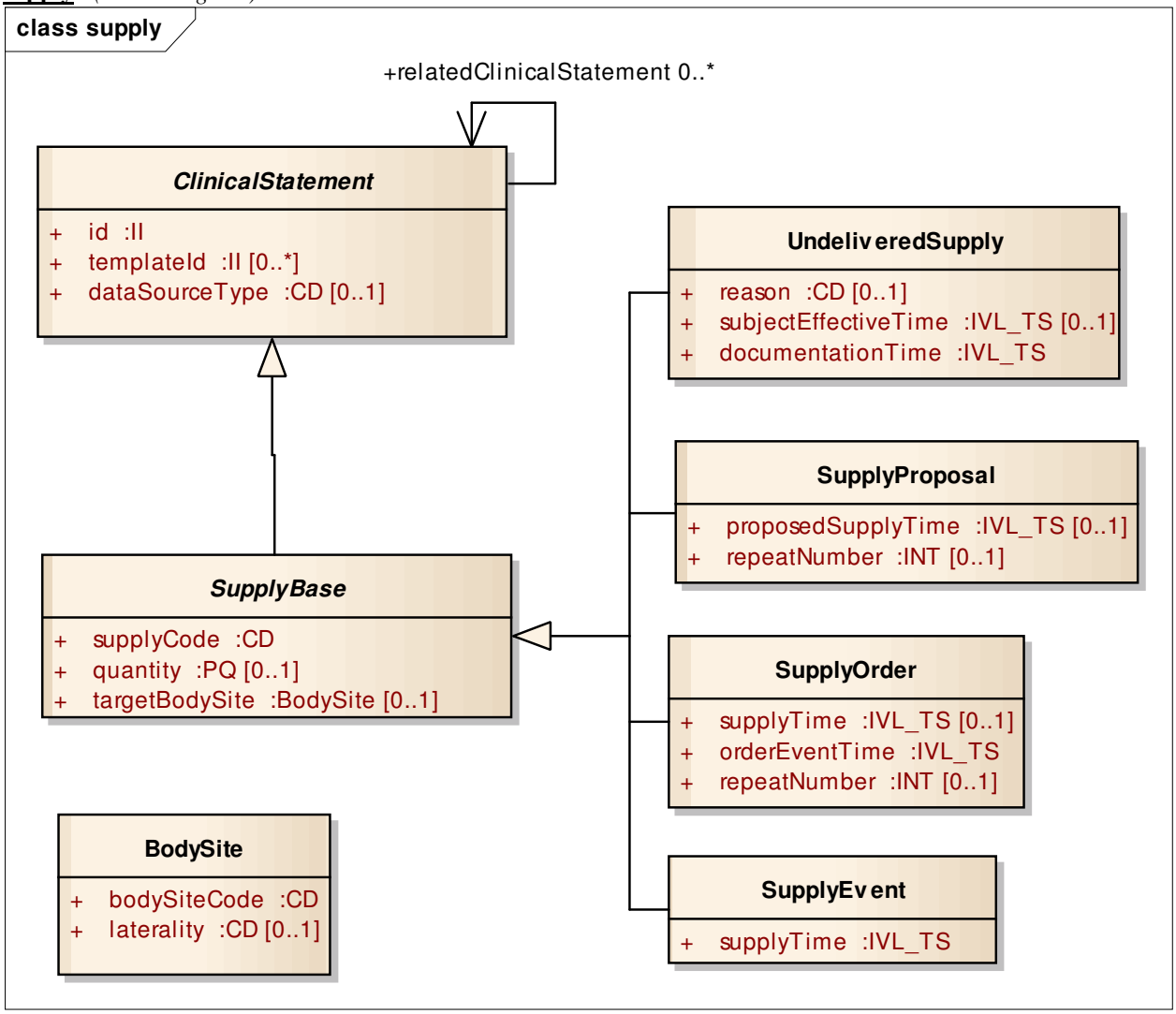

Figure: 14

3.1.4.1 AdministrableSubstance

Type: **Class** **Entity**
Package: vmr

A material of a particular constitution that can be given to a person to enable a clinical effect. It can have component administrable substances.

Attributes

Attribute	Notes
substanceCode CD	The code that identifies the substance with as much specificity as appropriate, or as required by a template. E.g., aspirin, lisinopril. May be either a generic or brand code, unless otherwise restricted by a template.
strength RTO [0..1]	The concentration of the substance. E.g., 250 mg per 5 ml.
form CD [0..1]	The physical form of the substance as presented to the subject. E.g., tablet, patch, injectable, inhalent.
substanceBrandCode CD [0..1]	A code describing the product as a branded or trademarked entity from a controlled vocabulary.
substanceGenericCode CD [0..1]	A code describing the product as a substance produced and distributed without patent protection.
manufacturer CD [0..1]	The organization that produces the substance. This is a CD and not an II because there are managed code systems for manufacturers.
lotNo ST [0..1]	The number assigned by the manufacturer to the batch of manufactured substances in which this substance instance belongs. Used for quality control purposes.

3.1.4.2 AdverseEvent

Type: **Class** **AdverseEventBase**
Package: vmr

unfavorable healthcare event (e.g., death, rash, difficulty breathing) that is thought to have been caused by some agent (e.g., a medication, immunization, food, or environmental agent).

Attributes

Attribute	Notes
criticality CD [0..1]	The clinical importance or seriousness of the adverse event. E.g., life-threatening, potentially requires hospitalization, self-resolving. Different from severity in that a moderate subarachnoid hemorrhage is likely to be highly critical, whereas a moderate headache is not.
severity CD [0..1]	The intensity of the adverse event. E.g., severe, moderate. If the adverseEventCode is rash and severity is moderate, it means that the adverse event was a moderate rash.
affectedBodySite BodySite [0..*]	A body site affected by the adverse event.
adverseEventStatus CD	The state of the effects of this adverse event. E.g., active, inactive, resolved.

3.1.4.3 AdverseEventBase

Type: **Class** **ClinicalStatement**
Package: vmr

Abstract base class for adverse events, which are unfavorable healthcare events (e.g., death, rash, difficulty breathing) that are thought to have been caused by some agent (e.g., a medication, immunization, food, or environmental agent). If a given agent is thought to cause multiple reactions, these reactions should be represented using multiple adverse events.

Attributes

Attribute	Notes
adverseEventCode CD	Coded nature of the effects of the adverse event; maps to the "value" of an adverse event observation. For an adverse event due to an identified agent, this is the reaction code. E.g., hives, difficulty breathing.
adverseEventAgent CD [0..1]	The causative agent of the adverse event, identified with as much specificity as available, or as required by a template. E.g., penicillin, peanuts.
adverseEventTime IVL_TS [0..1]	The time that reflects when the subject experienced the adverse event (in the case of AdverseEvent) or when the subject *did not* experience the adverse event (in the case of DeniedAdverseEvent).
documentationTime IVL_TS	The time when the adverse event was documented (e.g., entered into an electronic health record system by a care provider).

3.1.4.4 AppointmentProposal

Type: **Class** **EncounterBase**
Package: vmr

Proposal, e.g., by a CDS system, for an Encounter to take place.

Attributes

Attribute	Notes
criticality CD [0..1]	The urgency or importance of the proposed encounter.
proposedAppointmentTime IVL_TS [0..1]	Proposed time for appointment. Optional, as the proposer (e.g., a CDS system) may wish to simply propose an appointment of a type (e.g., encounter with eye professional) without specifying a specific appointment time interval. If repeatNumber >= 2, then specifies proposed period within which the appointments should take place. In these cases, it is assumed that the appointments should be evenly distributed within the timeframe. E.g., if proposed time is 1/1/2011 to 12/31/2011, and repeatNumber is 3, ideal appointment times would be 1/1/2011, 12/31/2011, and in the middle of the year.
repeatNumber INT [0..1]	The proposed number of appointment to make.

3.1.4.5 AppointmentRequest

Type: **Class** **EncounterBase**
Package: vmr

A request by a provider to schedule an appointment.

Attributes

Attribute	Notes
criticality CD [0..1]	The urgency or importance of the requested encounter.
requestedAppointmentTime IVL_TS	Requested time for appointment. If repeatNumber >= 2, then specifies requested period within which the appointments should take place. In these cases, it is assumed that the appointments should be evenly distributed within the timeframe. E.g., if requested time is 1/1/2011 to 12/31/2011, and repeatNumber is 3, ideal appointment times would be 1/1/2011, 12/31/2011, and in the middle of the year.
requestIssuanceTime IVL_TS	Time when the encounter appointment was requested by the provider, as opposed to the time it was requested for.
repeatNumber INT [0..1]	The requested number of appointment to make.

3.1.4.6 BodySite

Type: **Class**
Package: vmr

A location on an EvaluatedPerson's body. E.g., left breast, heart.

Attributes

Attribute	Notes
bodySiteCode CD	A location on an EvaluatedPerson's body. May or may not encompass laterality. E.g., lung, left lung.
laterality CD [0..1]	The side of the body, from the EvaluatedPerson's perspective. E.g., left, right, bilateral.

3.1.4.7 ClinicalStatement

Type: **Class**
Package: vmr

A record of something of clinical relevance that is being done, has been done, can be done, or is intended or requested to be done. An abstract base class that serves as the basis for concrete clinical statements, such as ObservationEvent and ProcedureProposal.

Naming and modeling conventions:

- in general, **attribute names** end in 'Code' if and only if the name of the attribute overlaps with the name of the parent class
- **times** are named as follows: **Time** is the default suffix for these attributes. **EventTime** is used to distinguish the time an order is placed vs. when the ordered act should take place. **EffectiveTime** and **TimeInterval** are used when there is a desire to emphasize that a prolonged time interval (e.g., > 1 day) can be used rather than a point in time or a short time interval. Note that regardless of the naming convention, **IVL_TS** attributes allow time intervals of any length.
- **subjectEffectiveTime** is the time that is primarily related to the subject's experience of disease or treatment events (or durations), rather than when those events were reported or recorded by the performer
- **performerEventTime** is the event time that is primarily related to the performer, rather than the subject.
- the **state between ordering and the ordered event occurring** is modeled only in cases of procedures and encounters, due to the substantial rate at which orders do not result in events.

Approaches to representing specific statements:

- No known allergies --> DeniedAdverseEvent with adverseEventAgentCode that is the generic root-level code for substances and adverseEventCode that its the generic root-level code for adverse events.
- No known drug allergies --> DeniedAdverseEvent with adverseEventAgentCode that is the root-level code for medications and adverseEventCode that its the generic root-level code for adverse events.
- No known food allergies --> DeniedAdverseEvent with adverseEventAgentCode that is the root-level code for food and adverseEventCode that its the generic root-level code for adverse events.
- No known medications --> UndeliveredSubstanceAdministration with substance that is the root-level code for medications.
- No known problems --> DeniedProblem with problemCode that is the root-level code for problems or conditions.
- Patient takes an unknown drug --> SubstanceAdministrationEvent where code for substance represents "unknown medication".

Attributes

Attribute	Notes
id II	A unique ID of this clinical statement for reference purposes. Does not need to be the actual ID of the source system.
templateId II [0..*]	The identifier of a set of constraints placed on a clinical statement.
dataSourceType CD [0..1]	A categorization of the type of information source making the clinical statement. Can be used, for example, to provide relevant information regarding the reliability of input data or to mark specific pieces of data as having been generated by a CDS system. E.g., administrative system, clinical system, patient or family member, external CDS system, this CDS system. Optional in the base vMR, but should consider providing when available.

3.1.4.8 ClinicalStatementEntityInRoleRelationship

Type: **AssociationClass**
Package: vmr

The relationship between a ClinicalStatement and an Entity serving the indicated function or position.

Attributes

Attribute	Notes
role CD	The function or position of the Entity in relationship to the ClinicalStatement. E.g., healthcare provider, laboratory specimen, subject of procedure.

3.1.4.9 ClinicalStatementRelationship

Type: **Class**
Package: vmr

The relationship between two ClinicalStatements.

Attributes

Attribute	Notes
targetRelationshipToSource CD	The target clinical statement's relationship to the source clinical statement. E.g., if relationship is "part of", then target clinical statement is part of source clinical statement. In an XML context, the target clinical statement would be the one that is enclosed within the source clinical statement.

3.1.4.10 DeniedAdverseEvent

Type: **Class** **AdverseEventBase**
Package: vmr

A denial that the subject has or had the specified adverse event. E.g., if adverseEventCode is hives, adverse event agent is penicillin, and documentation time is 2011-05-01, an assertion was made on 2011-05-01 that the subject does not get hives as a reaction to penicillin.

Common denials of adverse events to a class of agents can be expressed as follows:

- No known allergies --> DeniedAdverseEvent with adverseEventAgentCode that is the generic root-level code for substances and adverseEventCode that its the generic root-level code for adverse events.
- No known drug allergies --> DeniedAdverseEvent with adverseEventAgentCode that is the root-level code for medications and adverseEventCode that its the generic root-level code for adverse events.
- No known food allergies --> DeniedAdverseEvent with adverseEventAgentCode that is the root-level code for food and adverseEventCode that its the generic root-level code for adverse events.

3.1.4.11 DeniedProblem

Type: **Class** **ProblemBase**
Package: vmr

An assertion that the subject did not have the problem specified. For example, if problemCode is diabetes and diagnosticEventTime is 2011-05-01, then an assertion was made on 2011-05-01 that the subject does not have diabetes.

To assert that the subject has no known problems, a DeniedProblem can be asserted with a problemCode that is the root-level code for problems or conditions. E.g., if for a DeniedProblem, problemCode is the root-level code for problems or conditionsand diagnosticEventTime is 2011-05-01, then an assertion was made on 2011-05-01 that the subject has no known problems as of that date.

3.1.4.12 DoseRestriction

Type: **Class**
Package: vmr

Referred to in CDA release 2 as maxDoseQuantity. Specifies the maximum dose that can be given in a specified time interval.

Attributes

Attribute	Notes
maxDoseForInterval PQ	Maximum amount of substance that can be given within the specified time interval.
timeInterval PQ	The time interval during which the dose specified is the maximum amount that should be administered.

3.1.4.13 EncounterBase

Type: **Class** **ClinicalStatement**
Package: vmr

The abstract base class for an encounter of an EvaluatedPerson with the healthcare system. If an encounter or appointment has been canceled, it should simply not be provided using this model. This allows the encounter and appointment classes to be used without an explicit encounter status check.

Attributes

Attribute	Notes
encounterType CD	Identifies the type of encounter with as much specificity as available, or as required by a template. E.g., outpatient encounter, outpatient cardiology encounter.

3.1.4.14 EncounterEvent

Type: **Class** **EncounterBase**
Package: vmr

EncounterEvent is the record of an interaction between an EvaluatedPerson and the healthcare system. It can be used to group observations and interventions performed during that interaction, through the use of relatedClinicalStatements.

Attributes

Attribute	Notes
encounterEventTime IVL_TS	The time of the encounter.

3.1.4.15 Entity

Type: **Class**
Package: vmr

A physical thing, group of physical things or an organization.

Attributes

Attribute	Notes
id II	The entity's unique identifier. Used for internal tracking purposes; must be provided. Does not need to be the entity's "real" identifier.
templateId II [0..*]	The identifier of a set of constraints placed on an Entity.
entityType CD [0..1]	The specific type of entity. E.g., healtchare organization, medical facility, pacemaker.

3.1.4.16 EntityRelationship

Type: **AssociationClass**
Package: vmr

The relationship between one Entity and another Entity.

Attributes

Attribute	Notes
targetRole CD	The function or position served by the target Entity in relation to the source Entity. E.g., primary care provider, health insurance provider.
relationshipTimeInterval IVL_TS [0..1]	The timeframe in which the relationship existed. E.g., timeframe when a Person served as the primary care provider for an EvaluatedPerson.

3.1.4.17 EvaluatedPerson

Type: **Class** **Person**
Package: vmr

A person who is the subject of evaluation by a CDS system. May be the focal patient or some other relevant person (e.g., a relative or a sexual contact). Includes demographic attributes, clinical statements, and related entities.

Attributes

Attribute	Notes
birthTime TS [0..1]	The date on which the person was born.
ethnicity CD [0..*]	The person's ethnicity. An ethnicity or ethnic group is a group of people whose members identify with each other through a common heritage. E.g., Hispanic.
gender CD [0..1]	The person's gender. E.g., male, female. Typically will consist of administrative gender, with clinical gender noted using ObservationEvents.
race CD [0..*]	The person's race. Race is a classification of humans into large groups by various factors, such as heritable phenotypic characteristics or geographic ancestry. E.g., White, Asian.
preferredLanguage CD [0..1]	The person's language of preference. E.g., English.
age PQ [0..1]	The person's age at the time of CDS evaluation. May potentially be provided instead of birthTime when birthTime is not available. E.g., 3.5 months, 63 years.
isDeceased BL [0..1]	Whether the person is deceased. Included to support family history-based inferencing.
ageAtDeath PQ [0..1]	The age at which the person died. Included to support family history-based inferencing.

3.1.4.18 Facility

Type: **Class** **Entity**
Package: vmr

A property such as a building that has been established to enable the performance of specific activities, typically be organizations. E.g., a hospital or clinic.

Attributes

Attribute	Notes
name EN [0..*]	A word or a combination of words by which a facility is known.
address AD [0..*]	The place or the name of the place where a facility is located or may be reached.
telecom TEL [0..*]	A locatable resource of a facility that is identified by a URI, such as a web page, a telephone number (voice, fax or some other resource mediated by telecommunication equipment), an e-mail address, or any other locatable resource that can be specified by a URL.

3.1.4.19 Goal

Type: **Class** **GoalBase**
Package: vmr

A clinical end or aim towards which effort is directed.

Attributes

Attribute	Notes
goalObserverEventTime IVL_TS	The time that the observer made a note of the goal. It is primarily related to the creator or observer of the goal, rather than the subject.
goalStatus CD	State of the attempt to reach this goal. E.g., active, inactive.

3.1.4.20 GoalBase

Type: **Class** **ClinicalStatement**
Package: vmr

Abstract base class for a goal, which is a clinical end or aim towards which effort is directed.

Attributes

Attribute	Notes
goalFocus CD	This is the code that identifies the metric that is the clinical subject of the goal with as much specificity as available, or as required by a template. Typically a measurable clinical attribute of the subject. E.g., weight, blood pressure, hemoglobin A1c level.
criticality CD [0..1]	Urgency or importance of the goal. May reflect the threat to the patient's health that this goal addresses. E.g., critical, moderately important.
goalPursuitEffectiveTime IVL_TS [0..1]	The time in which the subject pursues the goal. This includes pursuing maintenance of a goal that has already been achieved. The end time of the interval may be "open" or not stated, if the goal is being indefinitely pursued. This time is optional, as, for example, a CDS system may simply wish to propose weight loss without specifying a pursuit effective time.
goalAchievementTargetTime IVL_TS [0..1]	The time that is targeted for the goal to be attained. For example, there may be a goal to reach a weight of X pounds by a particular date.
targetBodySite BodySite [0..1]	The body site that serves as the target of the goal. E.g., waist.
targetGoalValue ANY [0..1]	The metric whose achievement would signify the fulfillment of the goal. E.g., 150 pounds, 7.0%.

3.1.4.21 GoalProposal

Type: **Class** **GoalBase**
Package: vmr

Proposal, e.g., by a CDS system, for establishing the goal specified.

3.1.4.22 MissedAppointment

Type: **Class** **EncounterBase**
Package: vmr

An appointment that was (i) scheduled, (ii) not rescheduled or canceled, and (iii) for which the EvaluatedPerson did not show up.

Attributes

Attribute	Notes
appointmentTime IVL_TS	The time of the scheduled appointment that was missed.

3.1.4.23 ObservationBase

Type: **Class** **ClinicalStatement**
Package: vmr

The abstract base class for an observation, which is the act of recognizing and noting a fact.

Attributes

Attribute	Notes
observationFocus CD	This is the code that identifies the focus of the observation with as much specificity as available, or as required by a template. E.g., serum potassium level, hemoglobin A1c level, smoking status.
observationMethod CD [0..1]	The approach used to make the observation. E.g., direct measurement, indirect calculation, Enzyme-Linked Immunosorbent Assay.
targetBodySite BodySite [0..1]	The body site where the observation is being made. E.g., left lung.

3.1.4.24 ObservationOrder

Type: **Class** **ObservationBase**
Package: vmr

An order by a provider to conduct an observation, such as a laboratory test.

Attributes

Attribute	Notes
criticality CD [0..1]	Urgency or importance of observation. May be codes for the threat to the patient's health causing the need for the observation, or other coding system values indicating the urgency of a requested or proposed observation (eg, please do this CBC, STAT).
orderEventTime IVL_TS	Time when the order was created.
observationTime IVL_TS [0..1]	Time when the observation should be performed. If repeatNumber >= 2, then specifies period within which the observations should take place. In these cases, it is assumed that the observations should be evenly distributed within the timeframe. E.g., if proposed time is 1/1/2011 to 12/31/2011, and repeatNumber is 3, ideal observation times would be 1/1/2011, 12/31/2011, and in the middle of the year.
repeatNumber INT [0..1]	The number of times the observation should be made.

3.1.4.25 ObservationProposal

Type: **Class** **ObservationBase**
Package: vmr

Proposal, e.g., by a CDS system, for an Observation to take place.

Attributes

Attribute	Notes
criticality CD [0..1]	Urgency or importance of observation. May be codes for the threat to the patient's health causing the need for the observation, or other coding system values indicating the urgency of a requested or proposed observation (e.g., please do this CBC, STAT).
proposedObservationTime IVL_TS [0..1]	Time when it is proposed to do the observation. If repeatNumber >= 2, then specifies proposed period within which the observations should take place. In these cases, it is assumed that the observations should be evenly distributed within the timeframe. E.g., if proposed time is 1/1/2011 to 12/31/2011, and repeatNumber is 3, ideal observation times would be 1/1/2011, 12/31/2011, and in the middle of the year.
repeatNumber INT [0..1]	The number of times the observation should be made.

3.1.4.26 ObservationResult

Type: **Class** **ObservationBase**
Package: vmr

The findings from an observation.

Attributes

Attribute	Notes
observationEventTime IVL_TS	Time for the completion of the observation, including the interpretation.
observationValue ANY	Actual observed results. E.g., 6.5 mg/dL, 5.7%.
interpretation CD [0..*]	Explanation of the results. E.g., high, low, within normal limits.

3.1.4.27 Organization

Type: **Class** **Entity**
Package: vmr

An Entity representing a formalized group of persons or other organizations with a common purpose and the infrastructure to carry out that purpose. E.g., a healthcare delivery organization.

Attributes

Attribute	Notes
name EN [0..*]	A word or a combination of words by which an organization is known.
address AD [0..*]	The place or the name of the place where an organization is located or may be reached.
telecom TEL [0..*]	A locatable resource of an organization that is identified by a URI, such as a web page, a telephone number (voice, fax or some other resource mediated by telecommunication equipment), an e-mail address, or any other locatable resource that can be specified by a URL.

3.1.4.28 Person

Type: **Class** **Entity**
Package: vmr

A human being.

Attributes

Attribute	Notes
name EN [0..*]	A word or a combination of words by which a person is known.
address AD [0..*]	The place or the name of the place where a person is located or may be reached.
telecom TEL [0..*]	A locatable resource of a person that is identified by a URI, such as a web page, a telephone number (voice, fax or some other resource mediated by telecommunication equipment), an e-mail address, or any other locatable resource that can be specified by a URL.

3.1.4.29 Problem

Type: **Class** **ProblemBase**
Package: vmr

An assertion regarding a clinical condition of the subject that needs to be treated or managed.

Attributes

Attribute	Notes
importance CD [0..1]	Urgency or importance of problem. E.g., may be codes for primary, secondary as applies to an encounter diagnosis from administrative data, or codes for the degree of threat to the patient's health caused by the problem (e.g., life-threatening, requires hospitalization).
severity CD [0..1]	The intensity of the problem. E.g., severe, moderate.
problemStatus CD	State of the problem. E.g., active, inactive, resolved.
ageAtOnset PQ [0..1]	The subject's age when the problem began.
wasCauseOfDeath BL [0..1]	Whether the problem was the cause of the subject's death.

3.1.4.30 ProblemBase

Type: **Class** **ClinicalStatement**
Package: vmr

Abstract base class for problems, which are clinical conditions that need to be treated or managed.

Attributes

Attribute	Notes
problemCode CD	This is the code that identifies the problem or condition with as much specificity as available, or as required by a template. It might be an ICD9 or SNOMED code, or whatever vocabularies are appropriate to describe the problem or condition. E.g., diabetes mellitus, congestive heart failure.
problemEffectiveTime IVL_TS [0..1]	The time that is primarily related to the subject's experience of the disease or condition, rather than when those events were reported or recorded by the evaluater.
diagnosticEventTime IVL_TS	The time when the evaluater identified the subject as having the condition (in the case of Problem) or as not having the condition (in the case of DeniedProblem).
affectedBodySite BodySite [0..*]	A body site affected by the problem (in the case of Problem) or not affected by the problem (in the case of DeniedProblem).

3.1.4.31 ProcedureBase

Type: **Class** **ClinicalStatement**
Package: vmr

Abstract base class for a procedure, which is a series of steps taken on a subject to accomplish a clinical goal.

Attributes

Attribute	Notes
procedureCode CD	This is the code that identifies the procedure with as much specificity as available, or as required by a template. E.g., appendectomy, coronary artery bypass graft surgery.
procedureMethod CD [0..1]	The methodology used for the procedure. E.g., laproscopic surgery, robotic surgery.
approachBodySite BodySite [0..1]	The body site used for gaining access to the target body site. E.g., femoral artery for a coronary angiography.
targetBodySite BodySite [0..1]	The body site where the procedure takes place. E.g., coronary blood vessels for coronary angiography.

3.1.4.32 ProcedureEvent

Type: **Class** **ProcedureBase**
Package: vmr

The actual event of performing a procedure.

Attributes

Attribute	Notes
procedureTime IVL_TS	Time when procedure was done.

3.1.4.33 ProcedureOrder

Type: **Class** **ProcedureBase**
Package: vmr

An order for procedure to be done.

Attributes

Attribute	Notes
criticality CD [0..1]	Urgency or importance of the procedure.
orderEventTime IVL_TS	The time when the order was made.
procedureTime IVL_TS [0..1]	Ordered time for procedure. If repeatNumber >= 2, then specifies period within which the procedures should take place. In these cases, it is assumed that the procedures should be evenly distributed within the timeframe. E.g., if ordered time is 1/1/2011 to 12/31/2011, and repeatNumber is 3, ideal procedure times would be 1/1/2011, 12/31/2011, and in the middle of the year.
repeatNumber INT [0..1]	Number of times the procedure should take place.

3.1.4.34 ProcedureProposal

Type: **Class** **ProcedureBase**
Package: vmr

Proposals for a procedure to take place, e.g., generated by a CDS system or by a consulting clinician.

Attributes

Attribute	Notes
criticality CD [0..1]	Urgency or importance of the proposed procedure.
proposedProcedureTime IVL_TS [0..1]	Requested time for procedure. If repeatNumber >= 2, then specifies requested period within which the procedures should take place. In these cases, it is assumed that the procedures should be evenly distributed within the timeframe. E.g., if requested time is 1/1/2011 to 12/31/2011, and repeatNumber is 3, ideal procedure times would be 1/1/2011, 12/31/2011, and in the middle of the year.
repeatNumber INT [0..1]	Number of times the procedure is requested.

3.1.4.35 ScheduledAppointment

Type: **Class** **EncounterBase**
Package: vmr

A clinical appointment that has been scheduled. If rescheduled, the appointmentTime may change.

Attributes

Attribute	Notes
appointmentTime IVL_TS	The time of the scheduled appointment.

3.1.4.36 ScheduledProcedure

Type: **Class** **ProcedureBase**
Package: vmr

A procedure that has been scheduled to take place.

Attributes

Attribute	Notes
procedureTime IVL_TS	

3.1.4.37 Specimen

Type: **Class** **Entity**
Package: vmr

A sample of tissue, blood, urine, water, air, etc., taken for the purposes of diagnostic examination or evaluation.

3.1.4.38 SubstanceAdministrationBase

Type: **Class** **ClinicalStatement**
Package: vmr

Abstract base class for giving a material of a particular constitution to a person to enable a clinical effect.

Attributes

Attribute	Notes
substanceAdministrationGeneralPurpose CD	The general purpose for the substance administration. E.g., medication, immunization.
substance AdministrableSubstance	A material of a particular constitution that can be given to a person to enable a clinical effect.
deliveryMethod CD [0..1]	Methodology used to administer the substance. E.g., gastric feeding tube, gastrostomy.
doseQuantity IVL_PQ [0..1]	The amount of substance. E.g., 1 tab, 325 mg, 1-2 tabs.
deliveryRoute CD [0..1]	The physical route through which the substance is administered. E.g., IV, PO.
approachBodySite BodySite [0..1]	The body site used for gaining access to the target body site for the purposes of the substance administration.
targetBodySite BodySite [0..1]	The body site where the substance is delivered.
dosingPeriod IVL_PQ [0..1]	Together with dosingPeriodIntervalIsImportant, identifies the frequency of substance administration. dosingPeriod identifies the periodicity of doses within a 24 hour timeframe. E.g., a dosingPeriod of 8 hr would signify q8h if dosingPeriodIntervalIsImportant is true, and TID if dosingPeriodIntervalIsImportant is false.
dosingPeriodIntervalIsImportant BL [0..1]	Together with dosingPeriod, identifies the frequency of substance administration. dosingPeriod identifies the periodicity of doses within a 24 hour timeframe, whereas dosingPeriodIntervalIsImportant identifies whether doses should be equally spaced within that 24 hour period. E.g., a dosingPeriod of 8 hr would signify q8h if dosingPeriodIntervalIsImportant is true, and TID if dosingPeriodIntervalIsImportant is false.
deliveryRate IVL_PQ [0..1]	Rate of substance administration. E.g., 1000 mL/hr.

3.1.4.39 SubstanceAdministrationEvent

Type: **Class** **SubstanceAdministrationBase**
Package: vmr

The actual administration of the substance.

Handling of entries in "current medication list" with no other information than current medications would be as follows:
- SubstanceAdministrationEvent with documentationTime = time when snapshot was taken of current medication list, administrationEventTime = null if no information provided on when medication was started or stopped, administrationTime with specified Low but null High if information only provided on when medication was started.

To specify "patient takes an unknown drug", use a code for substance that represents "unknown medication".

Attributes

Attribute	Notes
doseNumber INT [0..1]	Identifies which dose this substance administration represents within a series of doses. Most commonly used for immunizations.
administrationTimeInterval IVL_TS [0..1]	The time when the substance is administered. An unspecified high time interval signifies that the administration is ongoing. Left optional to allow use for a medication list that does not have this information.
documentationTime IVL_TS	The time when the substance administration is documented.
informationAttestationType CD [0..1]	How the substance administration was claimed or verified. E.g., patient-reported, observed by care provider, performed by care provider. Can be used as a gauge of reliability, or when verified substance administration (e.g., for tuberculosis treatment) is required.

3.1.4.40 SubstanceAdministrationOrder

Type: **Class** **SubstanceAdministrationBase**
Package: vmr

A clinical order for a substance administration. Includes medication prescriptions.

Attributes

Attribute	Notes
criticality CD [0..1]	Urgency or importance of the substance administration. May be codes for the threat to the patient's health causing the need for the substance administration, or other coding system values indicating the urgency of an ordered substance administration (e.g., please give Vitamin K, STAT).
doseRestriction DoseRestriction [0..1]	Specifies the maximum dose that can be given in a specified time interval.
administrationTimeInterval IVL_TS	Ordered time for administering the substance.
dosingSig CD [0..*]	Directions for the substance administration as identified in Sig codes. E.g., qam, qhs, prn.
numberFillsAllowed INT [0..1]	The number of fills allowed. Must be 1 or greater.
orderEventTime IVL_TS	Time when order was made.

3.1.4.41 SubstanceAdministrationProposal

Type: **Class** **SubstanceAdministrationBase**
Package: vmr

Proposal for a substance administration. Used, for example, when a CDS system proposes that a medication or vaccination be given.

Attributes

Attribute	Notes
criticality CD [0..1]	Urgency or importance of the substance administration. May be codes for the threat to the patient's health causing the need for the substance administration, or other coding system values indicating the urgency of a proposed substance administration (e.g., please give Vitamin K, STAT).
doseRestriction DoseRestriction [0..1]	Specifies the maximum dose that can be given in a specified time interval.
proposedAdministrationTimeInterval IVL_TS [0..1]	Proposed time for administering the substance.
validAdministrationTimeInterval IVL_TS [0..1]	Acceptable time for administering the substance. Distinct from proposedAdministrationTimeInterval that this time includes acceptable but suboptimal administration times. This is an important aspect of immunizations, which have recommended and acceptable/valid timeframes for administration that can differ.
numberFillsAllowed INT [0..1]	The number of fills allowed. Must be 1 or greater.

3.1.4.42 SubstanceDispensationEvent

Type: **Class** **SubstanceAdministrationBase**
Package: vmr

This is the Event of a pharmacy filling a prescription.

Attributes

Attribute	Notes
daysSupply INT [0..1]	The number of days this dispensation should last.
dispensationQuantity PQ [0..1]	The amount of substance provided.
doseRestriction DoseRestriction [0..1]	Specifies the maximum dose that can be given in a specified time interval.
dispensationTime IVL_TS	Time when substance was dispensed.
fillNumber INT [0..1]	The current fill number. 1 if it is the first fill on this prescription, 2 if it is the second, etc. Must be 1 or greater.
fillsRemaining INT [0..1]	The number of fills remaining on prescription.
isValid BL [0..1]	Primarily designed to support analysis of previous immunizations

3.1.4.43 SupplyBase

Type: **Class** **ClinicalStatement**
Package: vmr

Abstract base class for the provision of some clinical material or equipment to the subject, such as a wheelchair.

Attributes

Attribute	Notes
supplyCode CD	This is the code that identifies the material supplied with as much specificity as available, or as required by a template. E.g., wheelchair, bandages.
quantity PQ [0..1]	Amount of material described by the supplyCode.
targetBodySite BodySite [0..1]	Body site where supply is to be used.

3.1.4.44 SupplyEvent

Type: **Class** **SupplyBase**
Package: vmr

The provision of some clinical material or equipment to the subject, such as a wheelchair.

Attributes

Attribute	Notes
supplyTime IVL_TS	When the supply was delivered.

3.1.4.45 SupplyOrder

Type: **Class** **SupplyBase**
Package: vmr

A provider's order to deliver the supply.

Attributes

Attribute	Notes
supplyTime IVL_TS [0..1]	Ordered time for supply. If repeatNumber >= 2, then specifies period within which the supplies should take place. In these cases, it is assumed that the supplies should be evenly distributed within the timeframe. E.g., if ordered time is 1/1/2011 to 12/31/2011, and repeatNumber is 3, ideal supply times would be 1/1/2011, 12/31/2011, and in the middle of the year.
orderEventTime IVL_TS	
repeatNumber INT [0..1]	Number of times supply should be delivered.

3.1.4.46 SupplyProposal

Type: **Class** **SupplyBase**
Package: vmr

Proposal, e.g., by a CDS system, for a Supply to be delivered.

Attributes

Attribute	Notes
proposedSupplyTime IVL_TS [0..1]	Requested time for supply. If repeatNumber >= 2, then specifies requested period within which the supplies should take place. In these cases, it is assumed that the supplies should be evenly distributed within the timeframe. E.g., if requested time is 1/1/2011 to 12/31/2011, and repeatNumber is 3, ideal supply times would be 1/1/2011, 12/31/2011, and in the middle of the year.
repeatNumber INT [0..1]	Number of times supply should be delivered.

3.1.4.47 UnconductedObservation

Type: **Class** **ObservationBase**
Package: vmr

A statement that an observation was not made. E.g., a statement that smoking status was not assessed.

Attributes

Attribute	Notes
reason CD [0..1]	The reason the observation was not made. E.g., inadequate time, patient refused.
subjectEffectiveTime IVL_TS [0..1]	Time when the observation might have been done, but was not. Optional, as may wish to simply note that an observation was never done.
documentationTime IVL_TS	Time when the provider noted that the observation was not made.

3.1.4.48 UndeliveredProcedure

Type: **Class** **ProcedureBase**
Package: vmr

Documentation that a procedure was not delivered. E.g., documentation that a surgery was not performed because the patient refused.

Attributes

Attribute	Notes
reason CD [0..1]	The reason the procedure was not performed. E.g., patient refused, inadequate time.

Attribute	Notes
subjectEffectiveTime IVL_TS [0..1]	Time when procedure might have been done, but was not. Optional, as may simply want to note that a procedure was never done.
documentationTime IVL_TS	Time when the non-delivery of the procedure was documented.

3.1.4.49 UndeliveredSubstanceAdministration

Type: **Class** **SubstanceAdministrationBase**
Package: vmr

Documents the non-delivery of a substance. E.g., documents that an influenza immunization was not given because the patient refused or had an adverse reaction to a previous flu vaccine.

Attributes

Attribute	Notes
reason CD [0..1]	Reason why the substance was not administered.
subjectEffectiveTime IVL_TS [0..1]	Time interval when subject did not receive substance. Optional, as may simply want to note that a particular substance was never administered.
documentationTime IVL_TS	Time time when the non-delivery of the substance was documented.

3.1.4.50 UndeliveredSupply

Type: **Class** **SupplyBase**
Package: vmr

Documentation that the indicated material was not provided to the subject.

Attributes

Attribute	Notes
reason CD [0..1]	The reason the supply was not provided. E.g., patient refused, inadequate time.
subjectEffectiveTime IVL_TS [0..1]	Time when the supply should have been delivered, but was not. Optional, as may simply want to note that a supply was never done.
documentationTime IVL_TS	Time when the non-delivery of the supply was documented.

3.1.4.51 VMR

Type: **Class**
Package: vmr

A virtual medical record (vMR) contains information about a patient relevant for CDS, either with regard to the data used for generating inferences (input) or the conclusions reached as a result of analyzing the data (output). A vMR may contain, for example, problems and medications or CDS-generated assessments and recommended actions. Note that CDS-generated assessments and recommended actions would typically be considered a CDS output but could also be used as a CDS input as well (e.g., prior CDS system recommendations could influence current CDS system recommendations).

This model does allow for the presence of information belonging to related persons (such as in the case of family history, or public health infectious disease cases) for a single patient. These related persons are modeled as EvaluatedPersons who have associated ClinicalStatements. Note that this model is not designed to be an information model for providing CDS for a large population.

Note that enumerations and value domains are anticipated to be specified in profiles in additional ballots.

Attributes

Attribute	Notes
templateId II [1..*]	The identifier of a set of constraints placed on a vMR.

3.1.5 dataTypes

Type: **Package**
Package: modelParent

Specifies data types used. The data types are a simplified/constrained version of ISO 21090 data types, which is an implementable specification based on the abstract HL7 version 3 data types specification, release 2.

dataTypes - *(Class diagram)*

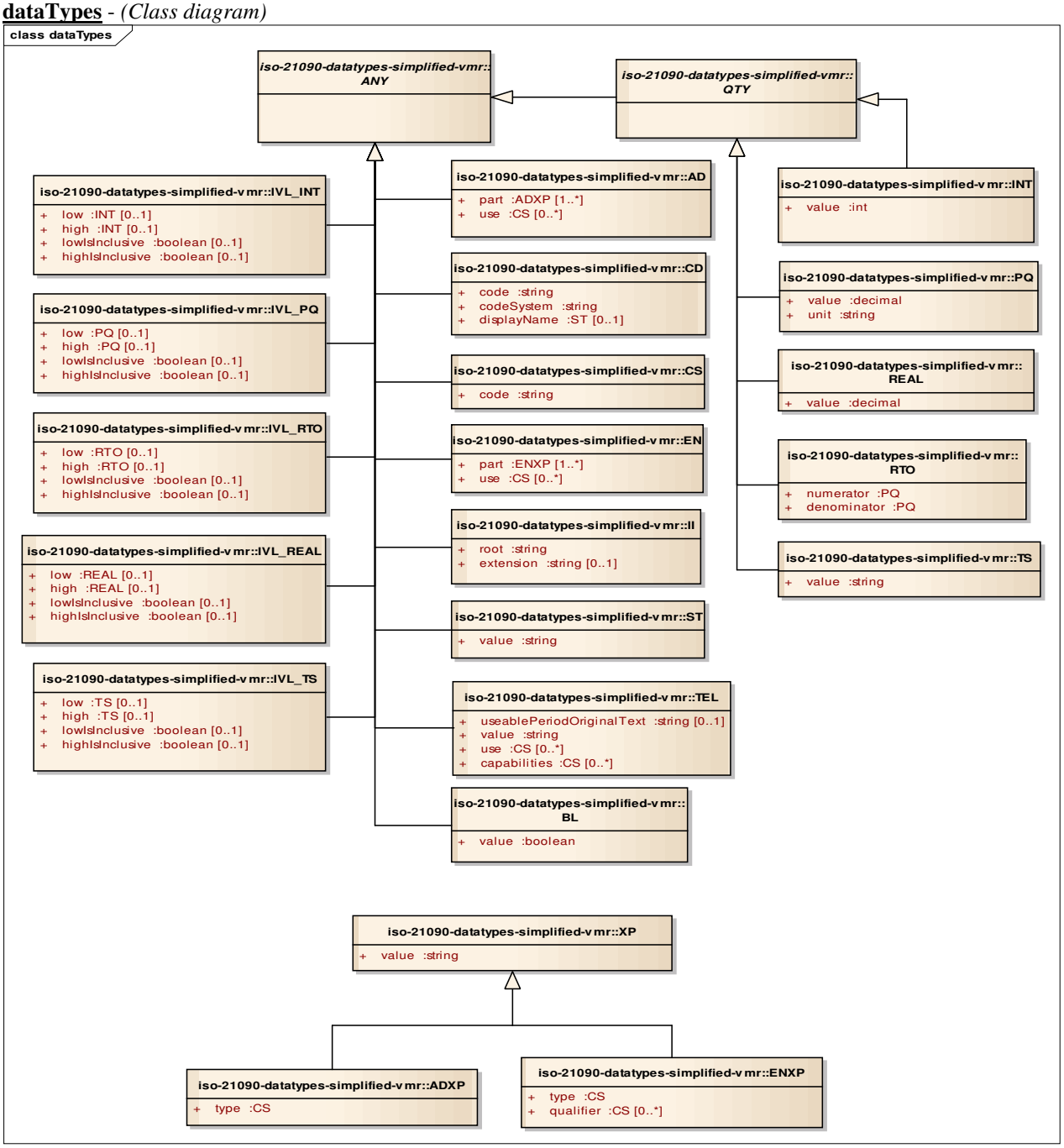

Figure: 15

3.1.5.1 iso-21090-datatypes-simplified-vmr

Type: **Class**
Package: dataTypes

3.1.5.1.1 AD

Type: **Class** **ANY**
Package: dataTypes

Mailing and home or office addresses.

AD is primarily used to communicate data that will allow printing mail labels, or that will allow a person to physically visit that address. The postal address datatype is not supposed to be a container for additional information that might be useful for finding geographic locations (e.g., GPS coordinates) or for performing epidemiological studies. Such additional information should be captured by other, more appropriate data structures.

Addresses are essentially sequences of address parts, but add a "use" code and a valid time range for information about if and when the address can be used for a given purpose.

Attributes

Attribute	Notes
part ADXP [1..*]	A sequence of address parts, such as street or post office Box, city, postal code, country, etc.
use CS [0..*]	A set of codes advising a system or user which address in a set of like addresses to select for a given purpose. An address without specific use code might be a default address useful for any purpose, but an address with a specific use code would be preferred for that respective purpose. If populated, the values contained in this attribute SHALL be taken from the HL7 PostalAddressUse code system.

3.1.5.1.2 ADXP

Type: **Class** **XP**
Package: dataTypes

A part with a type-tag signifying its role in the address. Typical parts that exist in about every address are street, house number, or post box, postal code, city, country but other roles may be defined regionally, nationally, or on an enterprise level (e.g. in military addresses).

Attributes

Attribute	Notes
type CS	Whether an address part names the street, city, country, postal code, post box, address line 1, etc. The value of this attribute SHALL be taken from the HL7 AddressPartType code system.

3.1.5.1.3 ANY

Type: **Class**
Package: dataTypes

Defines the basic properties of every data value. This is conceptually an abstract type, meaning that no proper value can be just a data value without belonging to any concrete type. Every public concrete type is a specialization of this general abstract DataValue type.

This class is maintained despite the lack of attributes to maintain compatibility with the ISO 21090 data structure.

3.1.5.1.4 BL

Type: **Class** **ANY**
Package: dataTypes

BL stands for the values of two-valued logic. A BL value can be either true or false.

Attributes

Attribute	Notes
value boolean	The value of the BL.

3.1.5.1.5 CD

Type: **Class** **ANY**
Package: dataTypes

A CD is a reference to a concept defined in an external code system, terminology, or ontology.

Attributes

Attribute	Notes
code string	The plain code symbol defined by the code system, or an expression in a syntax defined by the code system which describes the concept. Code SHALL be an exact match to a plain code symbol or expression defined by the code system. If the code system defines a code or expression that includes whitespace, the code SHALL include the whitespace. An expression can only be used where the codeSystem either defines an expression syntax, or there is a generally accepted syntax for the codeSystem. A code system may be defined that only defines an expression syntax with bindings to other code Systems for the elements of the expression. It is at the discretion of the interpreting system whether to check for an expression instead of a simple code and evaluate the expression instead of treating the expression as a code. In some cases, it may be unclear or ambiguous whether the code represents a single symbol or an expression. This usually arises where the code system defines an expression language and then defines pre-coordinated concepts with

Attribute	Notes
	symbols which match their expression, e.g. UCUM. In other cases, it is safe to treat the expression as a symbol. There is no guarantee that this is always safe: the definitions of the codeSystem should always be consulted to determine how to handle potential expressions.
codeSystem string	The code system that defines the code, or if no code was found, the codeSystem in which no code was found. Code systems SHALL be referred to by a UID, which allows unambiguous reference to standard code systems and other local codesystems. Where either ISO or HL7 have assigned UID to code Systems, then these UIDs SHALL be used. Otherwise implementations SHALL use an appropriate ISO Object Identifier (OID) or UUID to construct a globally unique local coding system identifier.
displayName ST [0..1]	A name, title, or representation for the code or expression as it exists in the code system. If populated, the displayName SHALL be a valid human readable representation of the concept as defined by the code system at the time of data entry. The displayName SHALL conform to any rules defined by the codingSystem; if the codeSystem does not define a human representation for the code or expression, then none can be provided. displayName is included both as a courtesy to an unaided human interpreter of a code value and as a documentation of the name used to display the concept to the user. The display name has no functional meaning; it SHALL never exist without a code; and it SHALL never modify the meaning of the code. A display name may not be present if the code is an expression for which no display name has been assigned or can be derived. Information Processing Entities claiming direct or indirect conformance MAY choose not to implement displayName but SHALL NOT reject instances because displayName is present. Display names SHALL not alter the meaning of the code value. Therefore, display names SHOULD NOT be presented to the user on a receiving application system without ascertaining that the display name adequately represents the concept referred to by the code value. Communication SHALL NOT simply rely on the display name. The display name's main purpose is to support implementation debugging.

3.1.5.1.6 CS

Type: **Class** **ANY**
Package: dataTypes

Coded data in its simplest form, where only the code is not predetermined.

The code system and code system version are implied and fixed by the context in which the CS value occurs.

Due to its highly restricted functionality, CS SHALL only be used for simple structural attributes with highly controlled and stable terminologies where:
- all codes come from a single code system
- codes are not reused if their concept is deprecated
- the publication and extensibility properties of the code system are well described and understood

Attributes

Attribute	Notes
code string	The plain code symbol defined by the code system. If the code value is empty or null, then there is no code in the code system that represents the concept. Code SHALL only contain characters that are either a letter, a digit, or one of '.', '-', '_' or ':'. Code systems that are used with CS SHALL NOT define code symbols or expression syntaxes that contain whitespace or any other characters not in this list.

3.1.5.1.7 EN

Type: **Class** **ANY**
Package: dataTypes

A name for a person, organization, place or thing.

Examples: Jim Bob Walton, Jr., Health Level Seven, Inc., Lake Tahoe, etc. An entity name may be as simple as a character string or may consist of several entity name parts, such as, Jim, Bob, Walton, and Jr., Health Level Seven, and Inc.

Entity names are essentially sequences of entity name parts, but add a "use" code.

Attributes

Attribute	Notes
part ENXP [1..*]	A sequence of name parts, such as given name or family name, prefix, suffix, etc.
use CS [0..*]	A set of codes advising a system or user which name in a set of names to select for a given purpose. A name without specific use code might be a default name useful for any purpose, but a name with a specific use code would be preferred for that respective purpose. Names SHOULD not be collected without at least one use code, but names MAY exist without use code, particularly for legacy data. If populated, the values contained in this attribute SHALL be taken from the HL7 EntityNameUse2 code system

3.1.5.1.8 ENXP

Type: **Class** **XP**
Package: dataTypes

A part with a type code signifying the role of the part in the whole entity name, and qualifier codes for more detail about the name part type. (Typical name parts for person names are given names, and family names, titles, etc.).

Attributes

Attribute	Notes
type CS	Indicates whether the name part is a given name, family name, prefix, suffix, etc. The value of this attribute SHALL be taken from the HL7 EntityNamePartType2 code system.
qualifier CS [0..*]	The qualifier is a set of codes each of which specifies a certain subcategory of the name part in addition to the main name part type. For example, a given name may be flagged as a nickname (CL), a family name may be a name acquired by marriage (SP) or a name from birth (BR). If populated, the values contained in this attribute SHALL be taken from the HL7 EntityNamePartQualifier2 code system.

3.1.5.1.9 II

Type: **Class** **ANY**
Package: dataTypes

An identifier that uniquely identifies a thing or object.

Examples are object identifier for HL7 RIM objects, medical record number, order id, service catalog item id, Vehicle Identification Number (VIN), etc. Instance identifiers are usually defined based on ISO object identifiers.

An identifier allows someone to select one record, object or thing from a set of candidates. Usually an identifier alone without any context is not usable. Identifiers are distinguished from concept descriptors as concept descriptors never identify an individual thing, although there may sometimes be an individual record or object that represents the concept.

Information Processing Entities claiming direct or indirect conformance SHALL never assume that receiving applications can infer the identity of issuing authority or the type of the identifier from the identifier or components thereof.

Attributes

Attribute	Notes
root string	A unique identifier that guarantees the global uniqueness of the instance identifier. If root is populated, and there is no extension, then the root is a globally unique identifier in its own right. In the presence of a non-null extension, the root is the unique identifier for the "namespace" of the identifier in the extension. Note that this does NOT necessarily correlate with the organization that manages the issuing of the identifiers. A

Attribute	Notes
	given organization may manage multiple identifier namespaces, and control over a given namespace may transfer from organization to organization over time while the root remains the same. This field can be either a DCE UUID, an Object Identifier (OID), or a special identifier taken from lists that may be published by ISO or HL7. Comparison of root values is always case sensitive. UUID's SHALL be represented in upper case, so UUID case should always be preserved. The root SHALL not be used to carry semantic meaning - all it does is ensure global computational uniqueness.
extension string [0..1]	A character string as a unique identifier within the scope of the identifier root. The root and extension scheme means that the concatenation of root and extension SHALL be a globally unique identifier for the item that this II value identifies. Some identifier schemes define certain style options to their code values. For example, the U.S. Social Security Number (SSN) is normally written with dashes that group the digits into a pattern "123-12-1234". However, the dashes are not meaningful and a SSN can also be represented as "123121234" without the dashes. In the case where identifier schemes provide for multiple representations, HL7 or ISO may make a ruling about which is the preferred form and document that ruling where that respective external identifier scheme is recognized. If no *extension* attribute is provided in a non-null *II*, then the root is the complete unique identifier.

3.1.5.1.10 INT

Type: **Class** **QTY**
Package: dataTypes

Integer numbers (-1,0,1,2, 100, 3398129, etc.) are precise numbers that are results of counting and enumerating. Integer numbers are discrete, the set of integers is infinite but countable. No arbitrary limit is imposed on the range of integer numbers.

Attributes

Attribute	Notes
value int	The value of the INT. Note that this specification imposes no limitations on the size of integer, but most implementations will map this to a 32 or 64 bit integer.

3.1.5.1.11 IVL_INT

Type: **Class** **ANY**
Package: dataTypes

A set of consecutive values of an ordered base datatype.

Any ordered type can be the basis of an IVL; it does not matter whether the base type is discrete or continuous. If the base datatype is only partially ordered, all elements of the IVL must be elements of a totally ordered subset of the partially ordered datatype. For example, PQ is considered ordered. However the ordering of PQs is only partial; a total order is only defined among comparable quantities (quantities of the same physical dimension). While IVLs between 2 and 4 meter exists, there is no IVL between 2 meters and 4 seconds.

Attributes

Attribute	Notes
low INT [0..1]	This is the low limit. If the low limit is not known, it may be null. The low limit SHALL NOT be positive infinity.
high INT [0..1]	This is the high limit. If the high limit is not known, it may be null. The high limit SHALL NOT be negative infinity, and SHALL be higher than the low limit if one exists.
lowIsInclusive boolean [0..1]	This attribute is called lowIsClosed in the ISO 21090 specification. Whether low is included in the IVL (is closed) or excluded from the IVL (is open).
highIsInclusive boolean [0..1]	This attribute is called highIsClosed in the ISO 21090 specification. Whether high is included in the IVL (is closed) or excluded from the IVL (is open).

3.1.5.1.12 IVL_PQ

Type: **Class** **ANY**
Package: dataTypes

A set of consecutive values of an ordered base datatype.

Any ordered type can be the basis of an IVL; it does not matter whether the base type is discrete or continuous. If the base datatype is only partially ordered, all elements of the IVL must be elements of a totally ordered subset of the partially ordered datatype. For example, PQ is considered ordered. However the ordering of PQs is only partial; a total order is only defined among comparable quantities (quantities of the same physical dimension). While IVLs between 2 and 4 meter exists, there is no IVL between 2 meters and 4 seconds.

Attributes

Attribute	Notes
low PQ [0..1]	This is the low limit. If the low limit is not known, it may be null. The low limit SHALL NOT be positive infinity.
high PQ [0..1]	This is the high limit. If the high limit is not known, it may be null. The high limit SHALL NOT be negative infinity, and SHALL be higher than the low limit if one exists.
lowIsInclusive boolean [0..1]	This attribute is called lowIsClosed in the ISO 21090 specification. Whether low is included in the IVL (is closed) or excluded from the IVL (is open).

Attribute	Notes
highIsInclusive boolean [0..1]	This attribute is called highIsClosed in the ISO 21090 specification. Whether high is included in the IVL (is closed) or excluded from the IVL (is open).

3.1.5.1.13 IVL_REAL

Type: **Class** **ANY**
Package: dataTypes

A set of consecutive values of an ordered base datatype.

Any ordered type can be the basis of an IVL; it does not matter whether the base type is discrete or continuous. If the base datatype is only partially ordered, all elements of the IVL must be elements of a totally ordered subset of the partially ordered datatype. For example, PQ is considered ordered. However the ordering of PQs is only partial; a total order is only defined among comparable quantities (quantities of the same physical dimension). While IVLs between 2 and 4 meter exists, there is no IVL between 2 meters and 4 seconds.

Attributes

Attribute	Notes
low REAL [0..1]	This is the low limit. If the low limit is not known, it may be null. The low limit SHALL NOT be positive infinity.
high REAL [0..1]	This is the high limit. If the high limit is not known, it may be null. The high limit SHALL NOT be negative infinity, and SHALL be higher than the low limit if one exists.
lowIsInclusive boolean [0..1]	This attribute is called lowIsClosed in the ISO 21090 specification. Whether low is included in the IVL (is closed) or excluded from the IVL (is open).
highIsInclusive boolean [0..1]	This attribute is called highIsClosed in the ISO 21090 specification. Whether high is included in the IVL (is closed) or excluded from the IVL (is open).

3.1.5.1.14 IVL_RTO

Type: **Class** **ANY**
Package: dataTypes

A set of consecutive values of an ordered base datatype.

Any ordered type can be the basis of an IVL; it does not matter whether the base type is discrete or continuous. If the base datatype is only partially ordered, all elements of the IVL must be elements of a totally ordered subset of the partially ordered datatype. For example, PQ is considered ordered. However the ordering of PQs is only partial; a total order is only defined among comparable quantities (quantities of the same physical dimension). While IVLs between 2 and 4 meter exists, there is no IVL between 2 meters and 4 seconds

Attributes

Attribute	Notes
low RTO [0..1]	This is the low limit. If the low limit is not known, it may be null. The low limit SHALL NOT be positive infinity.
high RTO [0..1]	This is the high limit. If the high limit is not known, it may be null. The high limit SHALL NOT be negative infinity, and SHALL be higher than the low limit if one exists.
lowIsInclusive boolean [0..1]	This attribute is called lowIsClosed in the ISO 21090 specification. Whether low is included in the IVL (is closed) or excluded from the IVL (is open).
highIsInclusive boolean [0..1]	This attribute is called highIsClosed in the ISO 21090 specification. Whether high is included in the IVL (is closed) or excluded from the IVL (is open).

3.1.5.1.15 IVL_TS

Type: **Class** **ANY**
Package: dataTypes

A set of consecutive values of an ordered base datatype.

Any ordered type can be the basis of an IVL; it does not matter whether the base type is discrete or continuous. If the base datatype is only partially ordered, all elements of the IVL must be elements of a totally ordered subset of the partially ordered datatype. For example, PQ is considered ordered. However the ordering of PQs is only partial; a total order is only defined among comparable quantities (quantities of the same physical dimension). While IVLs between 2 and 4 meter exists, there is no IVL between 2 meters and 4 seconds.

Attributes

Attribute	Notes
low TS [0..1]	This is the low limit. If the low limit is not known, it may be null. The low limit SHALL NOT be positive infinity.
high TS [0..1]	This is the high limit. If the high limit is not known, it may be null. The high limit SHALL NOT be negative infinity, and SHALL be higher than the low limit if one exists.
lowIsInclusive boolean [0..1]	This attribute is called lowIsClosed in the ISO 21090 specification. Whether low is included in the IVL (is closed) or excluded from the IVL (is open).

Attribute	Notes
highIsInclusive boolean [0..1]	This attribute is called highIsClosed in the ISO 21090 specification. Whether high is included in the IVL (is closed) or excluded from the IVL (is open).

3.1.5.1.16 PQ

Type: **Class** **QTY**
Package: dataTypes

A dimensioned quantity expressing the result of measuring.

Attributes

Attribute	Notes
value decimal	The number which is multiplied by the unit to make the PQ.
unit string	The unit of measure specified in the Unified Code for Units of Measure (UCUM). UCUM defines two forms of expression, case sensitive and case insensitive. *PQ* uses the case sensitive codes. The codeSystem OID for the case sensitive form is 2.16.840.1.113883.6.8. The default value for unit is the UCUM code "1" (unity). Equality of physical quantities does not require the values and units to be equal independently. Value and unit is only how we represent physical quantities. For example, 1 m equals 100 cm. Although the units are different and the values are different, the physical quantities are equal. Therefore one should never expect a particular unit for a physical quantity but instead allow for automated conversion between different comparable units. The unit SHALL come from UCUM, which only specifies unambiguous measurement units. Sometimes it is not clear how some measurements in healthcare map to UCUM codes. Note: The general pattern for a measurement is *value* unit of **Thing**. In this scheme, the PQ represents the *value* and the unit, and the **Thing** is described by some coded concept that is linked to the PQ by the context of use. This maps obviously to some measurements, such as **Patient Body Temperature** of *37* Celsius, and *250* mg/day of **Salicylate**. However for some measurements that arise in healthcare, the scheme is not so obvious. Two classic examples are 5 Drinks of Beer, and 3 Acetominophen tablets. At first glance it is tempting to classify these measurments like this: *5* drinks of **Beer** and *3* **Acetominophen** tablets. The problem with this is that UCUM does not support units of "beer", "tablets" or "scoops". The reason for this is that neither tablets or scoops are proper units. What kind of tablets? How big is the glass? In these kinds of cases, the concept that appears to be a unit needs to further specified before interoperability is established. If a correct amount is required, then it is generally appropriate to specify an exact measurement with an appropriate UCUM unit. If this is not possible, then the concept is not part of the measurement. UCUM provides a unit called unity for use in these cases. The proper way to understand these measurements as *3* 1 **Acetominophen** tablets, where 1 is the UCUM unit for unity, and the **Thing** has a qualifier. The context of use will need to provide the extra qualifying information.

3.1.5.1.17 QTY

Type: **Class** **ANY**
Package: dataTypes

The quantity datatype is an abstract generalization for all datatypes whose domain values has an order relation (less-or-equal) and where difference is defined in all of the datatype's totally ordered value subsets.

3.1.5.1.18 REAL

Type: **Class** **QTY**
Package: dataTypes

Fractional numbers. Typically used whenever quantities are measured, estimated, or computed from other real numbers. The typical representation is decimal, where the number of significant decimal digits is known as the precision.

Attributes

Attribute	Notes
value decimal	The value of the REAL.

3.1.5.1.19 RTO

Type: **Class** **QTY**
Package: dataTypes

A quantity constructed as the quotient of a numerator quantity divided by a denominator quantity.
Common factors in the numerator and denominator are not automatically cancelled out.
The RTO datatype supports titers (e.g., 1:128) and other quantities produced by laboratories that truly represent ratios. Ratios are not simply structured numerics, particularly blood pressure measurements (e.g. 120/60) are not ratios.
Notes:
1. Ratios are different from rational numbers, i.e., in ratios common factors in the numerator and denominator never cancel out. A ratio of two real or integer numbers is not automatically reduced to a real number. This datatype is not defined to generally represent rational numbers. It is used only if common factors in numerator and denominator are not supposed to cancel out. This is only rarely the case. For observation values, ratios occur almost exclusively with titers. In most other cases, REAL should be used instead of the RTO.

Attributes

Attribute	Notes
numerator PQ	The quantity that is being divided in the ratio
denominator PQ	The quantity that divides the numerator in the ratio. The denominator SHALL not be zero.

3.1.5.1.20 ST

Type: **Class** **ANY**
Package: dataTypes

The character string datatype stands for text data, primarily intended for machine processing (e.g., sorting, querying, indexing, etc.) or direct display. Used for names, symbols, presentation and formal expressions.

A ST SHALL have at least one character or else be null.

Attributes

Attribute	Notes
value string	The actual content of the string.

3.1.5.1.21 TEL

Type: **Class** **ANY**
Package: dataTypes

A locatable resource that is identified by a URI, such as a web page, a telephone number (voice, fax or some other resource mediated by telecommunication equipment), an e-mail address, or any other locatable resource that can be specified by a URL.

The address is specified as a Universal Resource Locator (URL) qualified by time specification and use codes that help in deciding which address to use for a given time and purpose.

The value attribute is constrained to be a uniform resource locator specified according to IETF RFCs 1738 and 2806 when used in this datatype.

Note: The intent of this datatype is to be a locator, not an identifier; this datatype is used to refer to a locatable resource using a URL, and knowing the URL allows one to locate the object. However some use cases have arisen where a URI is used to refer to a locatable resource. Though this datatype allows for URIs to be used, the resource identified SHOULD always be locatable. A common use of locatable URIs is to refer to SOAP attachments.

Attributes

Attribute	Notes
useablePeriodOriginalText string [0..1]	This attribute is equivalent to the originalText attribute within the useablePeriod attribute of this class in the ISO 21090 specification. The periods of time during which the telecommunication address can be used. For a telephone number, this can indicate the time of day in which the party can be reached on that telephone. For a web address, it may specify a time range in which the web content is promised to be available under the given address.
value string	A uniform resource identifier specified according to IETF RFC 2396. The URI specifies the protocol and the contact point defined by that protocol for the resource. Examples: Notable uses of the telecommunication address datatype are for telephone and telefax numbers, e-mail addresses, Hypertext references, FTP references, etc.
use CS [0..*]	One or more codes advising system or user which telecommunication address in a set of like addresses to select for a given telecommunication need.

Attribute	Notes
	The telecommunication use code is not a complete classification for equipment types or locations. Its main purpose is to suggest or discourage the use of a particular telecommunication address. There are no easily defined rules that govern the selection of a telecommunication address. Conformance statements may clarify what rules may apply or how additional rules are applied. If populated, the values contained in this attribute SHALL be taken from the HL7 TelecommunicationAddressUse code system
capabilities CS [0..*]	One or more codes advising a system or user what telecommunication capabilities are known to be associated with the telecommunication address. If populated, the values contained in this attribute SHALL be taken from the HL7 TelecommunicationCapability code system

3.1.5.1.22 TS

Type: **Class** **QTY**
Package: dataTypes

A quantity specifying a point on the axis of natural time. A point in time is most often represented as a calendar expression.

Attributes

Attribute	Notes
value string	The value of the TS. value is a string with the format "YYYY[MM[DD[HH[MM[SS[.U[U[U[U]]]]]]]][+|-ZZzz]" that conforms to the constrained ISO 8601 defined in ISO 8824 (ASN.1) under clause 32 (generalized time). The format should be used to the degree of precision that is appropriate.

3.1.5.1.23 XP

Type: **Class**
Package: dataTypes

A part of a name or address. Each part is a character string.

Attributes

Attribute	Notes
value string	The actual string value of the part.